

Lawrence Berkeley National Laboratory



Via email and certified mail

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March 25, 2016

Ms. Carmen Santos and Mr. Steve Armann  
US Environmental Protection Agency, Pacific Southwest, Region 9  
Land Division (LND-4-1)  
75 Hawthorne Street  
San Francisco, CA 94105

**Subject: Transmittal of amended pages for the *Application for Cleanup of Polychlorinated Biphenyls, Old Town Demolition Phase I Project***

Dear Ms. Santos and Mr. Armann,

Enclosed for your review and approval, please find pages that amend the *Application for Cleanup of Polychlorinated Biphenyls, Old Town Demolition Phase I Project* for Lawrence Berkeley National Laboratory (LBNL) that was submitted to your office on February 22, 2016. The amended pages describe the approach for the cleanup and disposal of polychlorinated biphenyl (PCB)-contaminated concrete and soil at Buildings 16 and 16A of the Old Town Demolition Phase I Project area of LBNL at One Cyclotron Road in Berkeley, California. Included in the amended pages are revisions made to address comments received from EPA on March 18, 2016 (sent via email to Ron Pauer of LBNL by Carmen Santos).

LBNL is a United States Department of Energy (DOE) national laboratory, operated and managed by The Regents of the University of California (UC) and located on property owned by UC. The amendment is being submitted jointly by UC and DOE. It has been prepared and approved by Dynamic Management Solutions, the demolition subcontractor for the Old Town Demolition Phase I Project and has been certified by Glenn Kubiak, Associate Laboratory Director for Operations and Chief Operating Officer for LBNL.

Please note that new data in Appendix C, consisting of analytical and validation reports for Buildings 16 and 16A, is provided on electronic media, due to the large volume of this data.

If you have any questions or require additional information, please contact Robert Cronin at [rdcronin@lbl.gov](mailto:rdcronin@lbl.gov) or 510-495-2849; or Kevin Bazzell at [kevin.bazzell@emcbc.doe.gov](mailto:kevin.bazzell@emcbc.doe.gov) or 510-486-5547.

Sincerely,

Robert Cronin  
Project Director  
Old Town Demolition Project  
Lawrence Berkeley National Laboratory  
**enclosure:**

Kevin Bazzell  
Federal Project Director  
Old Town Demolition Project  
U.S. Department of Energy

Amended pages for the *Application for Cleanup of Polychlorinated Biphenyls, Old Town Demolition Phase I Project* (amended pages for Appendix C, "Analytical Laboratory Reports and Data Validation Reports for 2015 Sampling at Buildings 52, 52A, and the Electrical Pad and Buildings 16 and 16A," provided on electronic media)

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### AMENDED PAGES

The pages listed below were revised to amend the *Application for Cleanup of Polychlorinated Biphenyls, Old Town Demolition Phase I Project*, Revision 0. Please replace the pages listed below with the amended pages.

Pages to remove	Pages to insert	Changed or Added Sections
Cover page	Cover page	–
–	Page I (add)	Certification
Pages iii-x	Pages iii-x	Table of Contents, List of Figures, List of Tables, List of Appendices
Pages 3-6	Page 3-6	Section 1.1 (top of page 4) and Section 1.3
Pages 17-22	Pages 17-22	All sections, except Section 2.3 and Table
Pages 29-30	Pages 29-30	Section 2.5.2 (third paragraph on page 29)
Pages 35-48	Pages 35-48	Sections 4.2 through 4.7 and Section 4.10
Pages 61-63	Pages 61-63	Sections 6.2 and 6.3
Pages 97-98	Pages 97-98	Section 15
Appendix A Cover	Appendix A and Figures A5–A8	New figures A5–A8
Appendix B Cover	Appendix B cover and Tables B-3 – B-5	New tables B3–B5
Appendix C Cover	Appendix C Cover	New data on USB drive
Appendix F	Appendix F (all pages)	All pages in appendix F



# Application for Cleanup of Polychlorinated Biphenyls

## Old Town Demolition Phase I Project

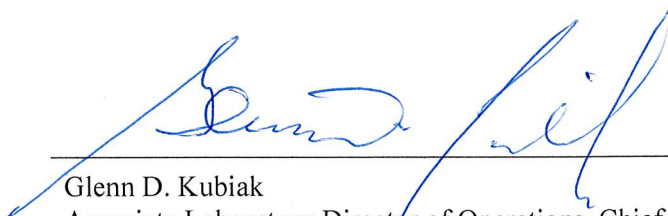
March 2016

Rev.	Reason for Revision	Originator	Date	Reviewer	Date
1	Addition of characterization data and cleanup plan for Buildings 16 and 16A				



## CERTIFICATION

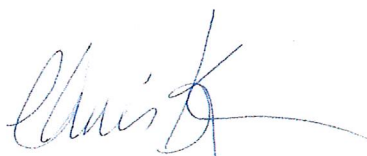
As required per 40 CFR Section 761.61(c), I certify that all sampling plans, sample collection procedures, sample preparation procedures, extraction procedures, and instrumental and chemical analysis procedures used to assess or characterize the PCB contamination at the Site, are on file at LBNL's offices at One Cyclotron Road in Berkeley, California and are available for EPA inspection. Under civil and criminal penalties of law for the making or submission of false or fraudulent statements or representations (18 United States Code [USC] 1001 and 15 USC 2615), I certify that the information contained in or accompanying this document is true, accurate, and complete. As to sections of this document for which I cannot personally verify truth and accuracy, I certify as an authorized official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate, and complete.



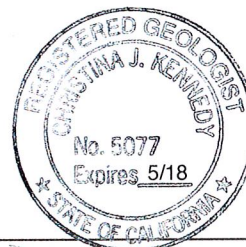
Glenn D. Kubiak  
Associate Laboratory Director of Operations, Chief Operating Officer  
Lawrence Berkeley National Laboratory

3-24-16

Date



Christina Kennedy, P.G.  
Technical Project Manager  
Dynamic Management Solutions, LLC



Date



Raoul Mebane  
Vice President  
Dynamic Management Solutions, LLC

3-24-16

Date

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### Appendix B. Summary Tables of PCB Analytical Results

- Summary of PCB Concentration Ranges in Above Slab Building Materials, Old Town Demolition Project.
- Table B-1 Summary of PCB Concentrations in Concrete and Sediment at Building 52, 52A and the Electrical Pad.
- Table B-2 Soil Sampling Results from Old Town Demolition Project, Buildings 52, 52A, Electrical Pad Area–Polychlorinated Biphenyls
- Table B-3 Concrete Sampling Results from Old Town Demolition Project Buildings 16/16A Polychlorinated Biphenyls.
- Table B-4 Sediment Sampling Results from Old Town Demolition Project Buildings 16/16A Polychlorinated Biphenyls.
- Table B-5 Soil Sampling Results from Old Town Demolition Project Buildings 16/16A Polychlorinated Biphenyls.

### Appendix C. Analytical Laboratory Reports and Data Validation Reports for 2015 Sampling at Buildings 52, 52A and the Electrical Pad and Buildings 16 and 16A

### Appendix D. Groundwater Sampling Results for Polychlorinated Biphenyls (PCBs) in the Old Town Demolition Project Area of Lawrence Berkeley National Laboratory, March 2, 2015.

### Appendix E. Standard Operating Procedure for Wipe Sampling

### Appendix F. Verification Sampling Grid Calculations and Determination

### Appendix G. Special Discharge Permit issued by East Bay Municipal Utility District

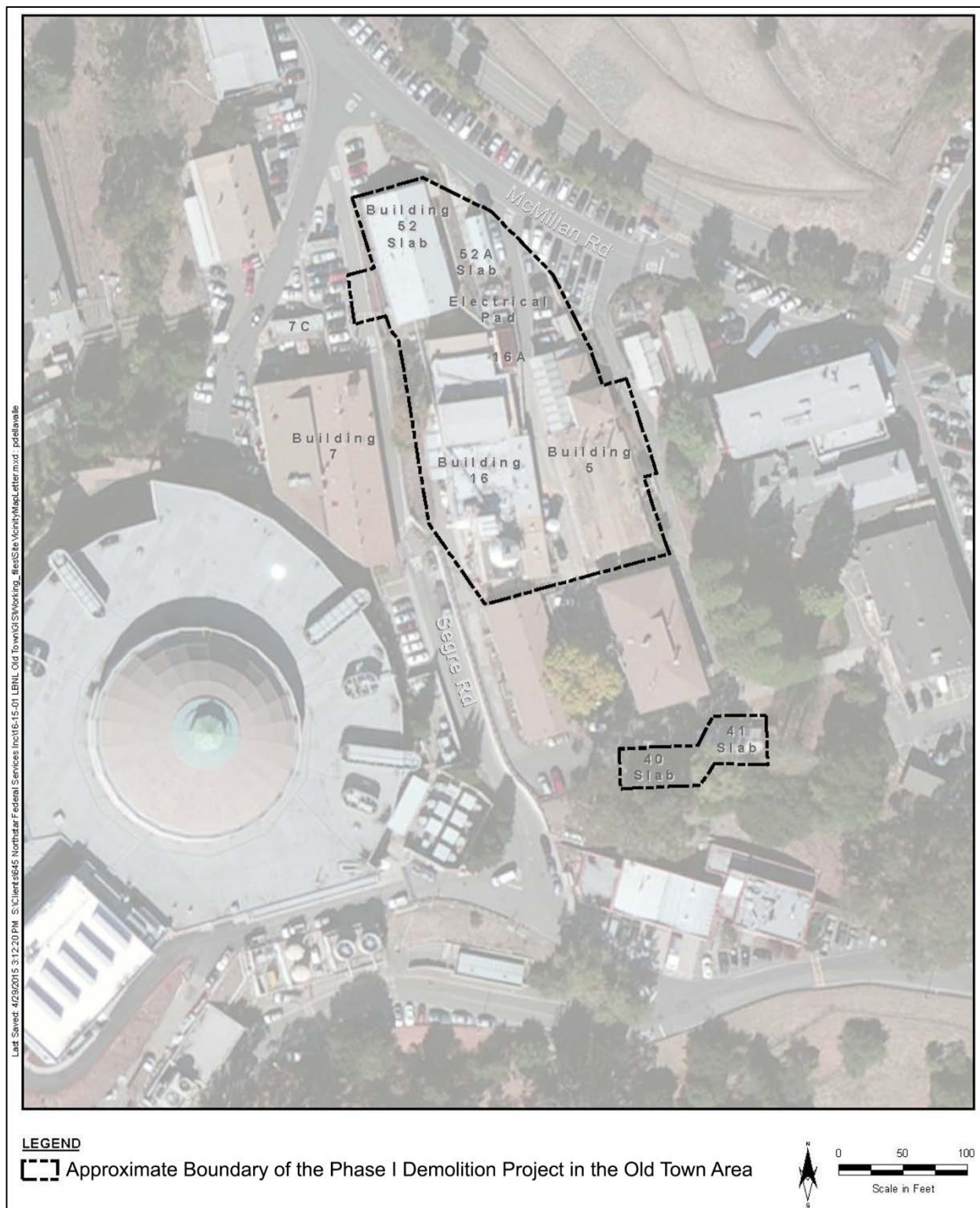
### Appendix H. Laboratory Certifications

### Appendix I. Specifications for Transmitting Analytical and QA/QC Data from a Subcontract Analytical Laboratory to Environment, Health and Safety Division, Lawrence Berkeley National Laboratory, April 26, 2012

## Acronyms and Abbreviations

°F	degrees Fahrenheit
ALARA	as low as reasonably achievable
BAAQMD	Bay Area Air Quality Management District
BMPs	best management practices
CCR	California Code of Regulations
CAG	Community Advisory Group
CFR	Code of Federal Regulations
COC	chain of custody
DMS	Dynamic Management Solutions, LLC
DOE	Department of Energy
DOT	Department of Transportation
DTSC	Department of Toxic Substances Control
EBMUD	East Bay Municipal Utility District
EDD	electronic data deliverable
EPA	United States Environmental Protection Agency
ERAC	Ecological Risk Assessment for Chemicals
LCS	laboratory control samples
LCD	laboratory control duplicates
LBNL	Lawrence Berkeley National Laboratory
LOQ	limit of quantitation
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
µg/kg	micrograms per kilogram
µg/l	micrograms per liter
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program
NEPA	National Environmental Policy Act

Figure 2. Site Vicinity Map



PCBs have been identified in building materials, concrete, and soil in and around Buildings 16, 16A, 52 and 52A, the electrical pad to the south of Building 52A, as well as in sediment in the storm drain system serving the Old Town area and in creeks to which the system discharges.

The PCB cleanup is scheduled to be conducted in two stages (which may be modified if site conditions require): the first stage, described in an initial application submitted to EPA on February 22, 2016, includes the removal of the foundation slabs and contaminated soils at Building 52, Building 52A, and the electrical pad. The second stage, described in the current amendment (Revision 1 of this application) addresses the removal of the foundation slabs and contaminated soils at Buildings 16 and 16A. PCB characterization data and an approach to cleanup of PCBs at the Site are presented in this application. If contamination requiring cleanup that is not addressed herein is discovered at the Site, additional amendment(s) may be submitted.

## **1.2 Regulatory Framework**

The EPA enforces regulations implementing TSCA, promulgated at 40 CFR, Part 761. This cleanup plan is being submitted to EPA per the requirements of 40 CFR Section 761.61(c) for risk-based cleanup of PCB remediation waste. Per 40 CFR Section 761.3, areas within a cleanup site encompass “the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of a cleanup of PCB remediation waste.” As such, the cleanup will address areas within the Old Town Demolition Phase I Project area (Figure 2) where PCBs have been released and are currently present at concentrations that exceed the risk-based cleanup goals established and documented in this cleanup plan. (References to sections of Part 761 of 40 CFR from this point in this document omit “40 CFR.”)

### **1.2.1 Federal Regulations for Radiological Materials and Waste**

Concrete and soil in limited areas of the Site are impacted by radiological constituents. Under the Atomic Energy Act of 1954, as amended, the DOE is the federal agency that regulates the use, storage, and disposal of radiological materials at LBNL. The Atomic Energy Act authorizes DOE to protect the health and safety of the public against radiation. It is the DOE’s objective to operate its facilities and conduct activities so that radiation exposures to members of the public and the environment are maintained as low as reasonably achievable (ALARA), per the requirements established in DOE Order 458.1, *Radiation Protection of the Public and the Environment*.

### **1.2.2 National Environmental Policy Act**

In 2009, the DOE evaluated the building demolition and soil cleanup at the Site as part of an evaluation of proposed decontamination, demolition, and environmental restoration of the Old Town area pursuant to the National Environmental Policy Act (NEPA). Per 10 CFR 1021.400, the DOE NEPA compliance officer concluded that the proposed project met the requirements for a categorical exclusion and that no further environmental review was required (DOE, 2009).

### **1.2.3 National Historic Preservation Act**

Based on a survey conducted in 2003 (Harvey, 2003), none of the structures within the Site were found to be eligible for listing on the National Register of Historic Places under the criteria in the National Historic Preservation Act. The Old Town area was also not found to be eligible for listing as a Historic District per the National Historic Preservation Act. The majority of the technological features and equipment that would convey the historic significance of the period (1943 to early 1960s) had long since been removed.

The buildings themselves were found not to embody unique or significant design characteristics; and since they had been repurposed and remodeled to accommodate changing uses, were deemed not to have retained the integrity necessary to convey historic significance as defined by the Act, either individually or in the broader view of Old Town as a historic district.

No other cultural features or resources have been found at the Site.

The California State Historic Preservation Officer concurred that buildings at the Site are not eligible to be listed on the National Register, neither individually nor as a historic district (Mikesell, Stephen D., 2004).

### **1.2.4 State, Regional, and Local Requirements**

State environmental regulatory oversight at LBNL primarily involves the DTSC, which regulates hazardous waste, and the San Francisco Bay Regional Water Quality Control Board (RWQCB), which regulates storm water discharges. In addition, the Bay Area Air Quality Management District (BAAQMD) regulates air emissions from stationary sources at LBNL. The City of Berkeley Toxics Management Division regulates hazardous material storage and on-site treatment of hazardous wastewater under the tiered permitting program. Discharges of treated water to the sanitary sewer at LBNL are regulated by the East Bay Municipal Utility District (EBMUD).

#### **1.2.4.1 Department of Toxic Substances Control**

Under the oversight of the DTSC, LBNL has conducted site investigations that indicate that volatile organic compounds, including tetrachloroethene, trichloroethene, carbon tetrachloride, and 1,1-dichloroethane, as well as petroleum hydrocarbons, PCBs, metals, and radionuclides have been released to the environment at LBNL. Some of these releases have migrated into soil and groundwater at the Facility, but have not migrated off-site. With the exception of radionuclide releases regulated pursuant to DOE's requirements, LBNL has been actively addressing those releases that pose a risk to human health or the environment under DTSC oversight.

In April 2014, LBNL notified DTSC of the presence of PCBs in soil at the Site at concentrations greater than 1 mg/kg for the sum of detected Aroclors. The DTSC has not made any requests in response to LBNL's notification. In September 2014, LBNL informed DTSC that access to the areas with PCB concentrations greater than 1 mg/kg had been restricted and that LBNL would be working with EPA on the PCB cleanup. LBNL currently meets with the EPA monthly to discuss the PCB cleanup project and its progress. All formal correspondence with EPA, including meetings notes, is shared with the DTSC. Copies of all plans and reports submitted to the EPA have been – and will continue to be – provided to DTSC. The completion report documenting the extent of excavation, confirmation sample results, and information on the disposal of any contaminated soil will also be provided.

#### **1.2.4.2 Regional Water Quality Control Board**

In August 2015, LBNL notified the RWQCB that very low concentrations (less than 0.1 mg/kg) of PCBs had been detected in creek sediments in the North Fork of Strawberry, Ravine, and Chicken Creeks, and that best management practices had been implemented by LBNL to prevent discharge of PCBs to storm drains. The RWQCB has not made any requests in response to LBNL's notification. In May 2015, LBNL notified the RWQCB that permit coverage was required for the Old Town Demolition Phase I Project under the State's General Construction Permit for storm water discharges, and coverage was granted.

#### **1.2.4.3 Bay Area Air Quality Management District**

The BAAQMD regulates emissions of toxic air contaminants, including PCBs. Emission sources that exceed trigger levels are subject to permit requirements of Regulation 2, Rule 1. Emissions that do not exceed the trigger levels do not require a permit.

The following chronic trigger levels are established by the BAAQMD for PCBs:

- 0.47 pounds per year for PCBs where PCB congeners with more than four chlorines comprise less than one-half percent of total PCBs (Low Risk); or
- 0.017 pounds per year for PCBs where congeners with more than four chlorines do not comprise less than one-half percent of total PCBs (High Risk);

No acute trigger levels have been set for PCBs.

Assessment of the demolition activities (applying conservative emission factors and the chronic trigger level of 0.017 pounds per year for High Risk PCBs) indicates that a BAAQMD permit is not required for the project.

#### **1.2.4.4 East Bay Municipal Utility District**

EBMUD will regulate discharges to the sanitary sewer of treated storm water that may accumulate in excavations and groundwater that may be extracted during the demolition activities. An EBMUD permit has been obtained by Dynamic Management Solutions (DMS), LBNL's demolition contractor, for these discharges and is included in Appendix G.

### **1.2.5 Community Interest**

An LBNL Community Advisory Group (CAG) was formed in 2010 to provide input on LBNL's physical plans and development projects. The CAG focuses primarily on land use, community health and safety, and the environment. The group meets quarterly to discuss a variety of topics, including capital projects. The Old Town Demolition Phase I Project was initially discussed with the CAG on June 15, 2015. LBNL has provided additional updates on the project at subsequent meetings.

## **1.3 Scope and Applicability**

This cleanup plan covers the removal and disposal of all PCB remediation waste at the Site in compliance with Section 761.61(c) and all other applicable parts of 761, such that the cleanup process, disposal, and end state are protective of human health and the environment. The cleanup plan includes contingencies to address potential PCB impacts beyond the Phase I Project boundary so that they can be properly addressed in the future (see Section 4.9).

This application includes characterization data and a proposed approach for the cleanup and disposal of concrete slabs and soil beneath and around Buildings 52 and 52A, the electrical pad to the east of Building 52, and as amended, Buildings 16 and 16A. Information applicable to the cleanup of the entire Site, such as the field sampling methods, analytical procedures, waste disposal requirements, and a verification sampling framework, are provided herein and will be applied to PCB remediation of the Site.

plans, at one point the building housed a large motor generator associated with research in Building 16. The superstructure was demolished in 2011 and only the concrete slab remains. Data collected in 2015 (see Figures A-1 and A-2 in Appendix A) indicate that PCBs are present in sediment that accumulated in trenches in the building pad and in soil beneath the northern end of the building. These data are discussed in detail in Section 2 below.

## 2 SITE CHARACTERIZATION

Soil samples have been collected from the Old Town Demolition Project at various times, including during investigations completed in 1995, 1996, 1997, 2000, 2010, and 2011 as part of facility investigations conducted under RCRA. Results of these investigations were documented in LBNL quarterly and semiannual progress reports (LBNL 1995–2016). Samples were analyzed for a variety of contaminants, including PCBs at some locations. Samples were analyzed for PCBs by EPA Method 8082, but until August 2014, the Soxhlet extraction method (EPA Method 3540C) had not been used. A complete description of the sampling results is given in the *Preliminary Subsurface Sampling Report, Old Town Demolition Project* (LBNL, 2014a).

In preparation for the demolition of buildings in the Old Town area, LBNL completed a number of additional investigations to characterize the buildings and soils in the Phase I area for potential contaminants that would require management during the demolition and soil removal. During an investigation conducted in 2014, PCBs were detected in building floor slabs and in soils at the Site (LBNL, 2014a). Notification of a historical PCB release at Building 52 was provided to DTSC and EPA on April 28, 2014. Notification of a historical PCB release at Building 16 was provided to DTSC and EPA on June 18, 2014.

To determine the full extent of the PCB contamination, starting in 2015, LBNL's demolition contractor, DMS, began collection of additional samples of building materials and of building slabs and soils per sampling plans shared with the EPA in 2015. A summary of the results of the building materials characterization is provided in Appendix B. No PCB contamination was detected in any of the building superstructures. PCBs were detected in building materials such as caulk, sealants, mastics, and paints in Buildings 5, 16, and 16A, and these materials were disposed of as PCB bulk product waste. One fixture, a fume hood in Building 16, was found to contain PCB residue within the plenum and ducting, and this fume hood was disposed of in its entirety as PCB remediation waste in compliance with Section 761.61(b).

Following the characterization of the building superstructures, samples of the slabs and soil were collected per the *Sampling and Analysis Plan PCB Data Gaps, Concrete and Soil* (DMS, 2015a). Characterization data for the slabs and soils at and around Buildings 52, 52A, 16, 16A, and the electrical pad, inclusive of data collected prior to 2015, are discussed below.

The PCB data collected in the environmental investigations summarized herein has been compared to a screening level of 0.94 mg/kg for total Aroclors selected as the cleanup goal for the Site because this value represents the concentration corresponding to a human health (excess cancer) risk of one in one million ( $1\text{E-}06$ ), which is deemed by EPA as the lower bound (*i.e.*, most conservative endpoint) of the acceptable risk range which is protective of human health (EPA, 2009). The selection of this cleanup goal is described in greater detail in Section 3. Waste disposal options for the demolition and cleanup of waste that will be generated were assessed by comparing the characterization data to the 50 mg/kg threshold, below which bulk remediation waste may be disposed of at a facility permitted, licensed, or registered by a State to manage non-municipal, or non-hazardous solid waste (see Section 5 for a discussion of disposal of remediation waste).

### 2.1 Slab Characterization

Samples of the concrete slabs and of sediment that had accumulated in trenches and sumps at Building 52, Building 52A and the electrical pad were collected in 2010, 2011, 2014, and 2015. Samples of the

concrete slabs and of sediment that had accumulated in trenches and sumps at Buildings 16 and 16A were collected in 2015 and 2016. The results are discussed below.

### **2.1.1 Building 52, Building 52A, and the Electrical Pad**

During a pre-demolition survey of Building 52 in 2010, PCBs were detected in sediment that had accumulated in concrete-lined utility trenches in this building and in three of ten concrete samples collected from the trench floors. Additional samples were collected from the trench floors in 2011. In 2012, the sediment and a section of the concrete trench floor contaminated with PCBs were excavated. The sediment was disposed of at Burlington Environmental facility in Kent, Washington; the concrete was sent for disposal to a facility in Livermore, California operated by Republic Services. No PCBs were detected in soil samples collected immediately beneath the trenches. The trenches were filled with low-strength concrete. In 2014, a 5-foot deep concrete-lined sump was discovered at the west terminus of one of the utility trenches that had been filled with the low-strength concrete. Samples of sediment and liquid that had collected in the sump contained 1,800 mg/kg and 4,500 micrograms per liter ( $\mu\text{g/L}$ ) total PCBs, respectively. This material was removed in 2014 and disposed of at a facility in Aragonite, Utah operated by Clean Harbors Aragonite, LLC permitted to accept such waste.

During December 2015 and January 2016, additional samples were collected from concrete slabs at Buildings 52 and 52A and the electrical pad, as well as from concrete surfaces beyond the footprints of these slabs, as shown in Figure A-1 in Appendix A. Samples were also collected of sediments observed in trenches at the electrical pad and at one location on the Building 52A slab. The sample locations and results are also shown in Figure A-1 in Appendix A. The sampling was conducted in accordance with the *Sampling and Analysis Plan PCB Data Gaps, Concrete and Soil* (DMS, 2015a). One concrete sample could not be collected due to safety concerns associated with entry into the concrete-lined sump at the west terminus of a utility trench. This sample was to be collected to assess the concentration of PCBs in the concrete for the purpose of waste disposal. In the absence of sample data, the sump will be managed as PCB remediation waste at a concentration greater than 50 mg/kg and disposed of as described in Section 5.1.4.

Total PCB results from concrete and sediment samples collected at Buildings 52 and 52A and the electrical pad, including historical results from concrete samples collected prior to 2015, are shown in Figure A-1 in Appendix A. The results are also summarized in Table B-1 in Appendix B. Sample results for sediment and concrete that had been removed and disposed of in 2012 and 2014 are excluded from this summary, as these data do not represent the current condition. These results had been shared with EPA in the *Sampling and Analysis Plan, PCB Data Gaps, Concrete and Soil* (DMS, 2015a). Values listed in boldface type in Table B-1 are of total PCBs detected at concentrations greater than the cleanup goal of 0.94 mg/kg. Values in shaded cells are total PCB concentrations greater than 50 mg/kg. Analytical reports and validation reports from the 2015 investigation are included in Appendix C.

These results indicate that total PCB concentrations in the concrete slab at Building 52 and electrical pad exceed 0.94 mg/kg, and in one location – a trench at Building 52 – exceed 50 mg/kg. Samples of sediment accumulated in sumps and utility trenches at Buildings 52 and 52A and the electrical pad also contained total PCB concentrations exceeding 0.94 mg/kg.

### **2.1.2 Building 16 and Building 16A**

Sampling of concrete slabs and of sediment that had accumulated in trenches and sumps at Buildings 16 and 16A was conducted in accordance with the *Sampling and Analysis Plan PCB Data Gaps, Concrete and Soil* (DMS, 2015a). In accordance with this plan, concrete samples were collected where cracks or

stains were observed in or on the concrete, and in low spots toward which liquids could have migrated or at which liquids could have accumulated. The following minor deviations from the sampling plan were required during the investigation:

1. One concrete sample located at the north end of Room 101 (see Figure A-5 in Appendix A) could not be collected because there was no concrete at the bottom of the sump at which the sample was to be collected. Soil samples were collected at this location instead (see samples 16-SD-107 and B16-SD-076 on Figure A-6).
2. One concrete sample could not be collected due to safety concerns associated with entry into a concrete pit (Room 137A, as shown on Figure A-5).

Results of this sampling are shown on Figure A-5 in Appendix A and summarized in Tables B-3 and B-4 in Appendix B. Values listed in boldface type in Tables B-3 and B-4 indicate samples in which total PCBs were detected at concentrations greater than the cleanup goal of 0.94 mg/kg. Analytical reports and validation reports for the data obtained during 2015 and 2016 are included in Appendix C.

The sampling results indicate that total PCB concentrations in the concrete slab at Building 16 exceed 0.94 mg/kg, but not 50 mg/kg. Results of samples collected at Building 16A show that concentrations of total PCBs in concrete slab are less than 0.94 mg/kg.

In addition to concrete samples, samples of sediment that had accumulated in trenches and sumps in Building 16 were also collected. Concentrations of total PCBs exceeded 0.94 mg/kg in almost every sediment sample. One sample collected from a trench in Room 198 contained more than 50 mg/kg total PCBs (see Figure A-5 in Appendix A). All of the sediment was removed prior to demolishing the building and placed into 55-gallon drums; sediment with more than 50 mg/kg of PCBs was segregated from the other sediment into one 55-gallon drum that is scheduled to be shipped to a disposal facility in Beatty, Nevada operated by US Ecology. The other drums (with less than 50 mg/kg of PCBs) were also shipped to the US Ecology facility in Beatty, Nevada.

Soil samples were collected directly or approximately, beneath the concrete and sediment that contained PCBs at concentrations that exceeded the cleanup goal. Those results are discussed in Section 2.2.2, below.

## 2.2 Soil Characterization

### 2.2.1 Building 52, Building 52A, and the Electrical Pad

From November 2015 through January 2016, soil samples were collected at Buildings 52 and 52A and the electrical pad in accordance with the *Sampling and Analysis Plan PCB Data Gaps, Concrete and Soil* (DMS, 2015a) and analyzed for PCBs. Minor deviations from the sampling plan were required during the investigation. A southernmost sample to the west of Building 52 (B52-SD-025) was collected approximately 7 feet west of the planned location due to obstructions and only the shallow soil was sampled due to auger refusal. This deviation did not affect the overall characterization of the area, as the modified location was sufficiently representative of the location intended to be sampled. Samples could not be collected from depths of 3 and 4 feet in boring B52-SD-008 as planned (DMS, 2015a) because gravel caved into the boring hole. A new boring was located adjacent to the abandoned one and above the Building 52/52A retaining wall.

A summary of analytical results from the soil investigation at Buildings 52 and 52A and the electrical pad is presented in Table B-1 in Appendix B. Values listed in boldface type in Tables B-1 through B-3 are total PCBs concentrations greater than the cleanup goal of 0.94 mg/kg. Analytical data and validation reports for these soil samples are included in Appendix C. Following is a brief overview of the results.

### **2.2.1.1 Building 52**

Results of soil sampling for PCBs in the vicinity of Building 52 are illustrated on Figure A-2 in Appendix A. Concentrations of total PCBs greater than 0.94 mg/kg were detected in one sample from beneath the western edge of the building slab, in soil samples collected in an unpaved area immediately west of the slab, and beneath the roadway beyond the unpaved strip. The detections were generally limited to shallow soil (at less than 2 feet depth) and were less than 50 mg/kg, except in two locations:

- 1) Around a pipe described in Section 1.4.7.6, which was found to be broken at the point at which it exited a sump on the west side of the building: The maximum concentration of total PCBs detected in this area was 840 mg/kg in a sample collected approximately 2 feet from the sump at a depth of 8 feet below ground surface (boring SB52-14-20). No PCBs were detected in samples collected at depths of 12.5 feet and deeper at this location.
- 2) North of the southwest corner of Building 52: Surface samples collected in this area contained PCBs at concentrations up to 122 mg/kg, the maximum concentration detected in boring SB52-14-43. PCB concentrations in the samples collected at depths of 1 and 3 feet in this boring exceeded 0.94 mg/kg, but the sample collected at a depth of 6 feet contained no detectable PCBs.

Except for a single sample (SB52-14-26 shown on Figure A-2 in Appendix A) collected immediately beneath the slab adjacent to the sump discussed above, PCBs were not detected in soil beneath the building slab or in the unpaved areas south and east of the building.

### **2.2.1.2 Building 52A**

Results of soil sampling for PCBs in the vicinity of Building 52A are illustrated on Figure A-2 in Appendix A. Soil samples were collected where numerous large cracks were observed along the margins of the utility trenches, which may provide possible conduits to the subsurface.

The results discussed below include those for samples collected to the east of the “Building 52/52A retaining” wall shown on the figure and to the north of the electrical pad. Detections of PCBs at concentrations greater than 0.94 mg/kg are generally limited to shallow soil (less than 3 feet depth).

PCBs were detected at total concentrations greater than 0.94 mg/kg in soil samples collected northwest of Building 52A and beneath a utility trench in the northwest part of the building, with the maximum concentration of 31.6 mg/kg detected in a sample collected approximately 5 feet northwest of the building at a depth of 1 foot (SB52A-14-1C). A sample collected at a depth of 3 feet at the same location contained total PCBs at a concentration less than 0.94 mg/kg.

### **2.2.1.3 Electrical Pad**

As shown on Figure A-2 in Appendix A, total PCB concentrations were less than 0.94 mg/kg in all samples collected in the vicinity of the electrical pad, except beneath a utility trench near the western edge of the pad, where 4.7 mg/kg of total PCBs were detected in boring B16-SD-058 collected at 0.5 feet beneath the trench. The utility trench was observed to be significantly cracked. The contamination detected beneath it appears to be limited to shallow soil, with total PCB concentration at 1-foot depth (the underlying sample) reported at less than 0.94 mg/kg.

## 2.2.2 Buildings 16 and 16A

From December 2015 through February 2016, soil samples were collected at Buildings 16 and 16A in accordance with the *Sampling and Analysis Plan PCB Data Gaps, Concrete and Soil* (DMS, 2015a) and analyzed for PCBs. The following deviations from the sampling plan were required during the investigation:

1. Soil samples were collected in Room 101 instead of concrete samples, as discussed in Section 2.1.2.
2. Two soil samples to the south of Building 16 (south of Room 101; see Figure A-6 in Appendix A) could not be collected because live subsurface high-voltage electrical lines in this area cannot be easily deactivated. Sample B16-SD-031 was collected in this area approximately 5 feet to the north and west of the planned sample locations (Figure A-6, in Appendix A).
3. Initially, two soil samples could not be collected in the low area immediately east of Building 16 and north of the Perkins Pad due to the presence of subsurface utilities, but samples from this location were collected on March 16, 2016 once the utilities were deactivated. The analytical results will be made available to EPA as soon they have been received and validated. The data will be used to refine the excavation plan if PCBs are detected at concentrations greater than the cleanup goal.
4. Samples were collected at one location (B16-SD-043 shown on Figure A-6 in Appendix) – not specified in the sampling plan – approximately 7 feet west of Room 101, where a large open seam was observed between concrete slabs. No PCBs were detected at that location.
5. Drilling equipment encountered refusal, which prevented the collection of one soil sample just outside the western door of Room 140. Other available data collected in nearby locations are considered sufficient to meet project objectives.

A summary of the analytical results from the soil investigation at Buildings 16 and 16A is presented in Table B-5 in Appendix B. Analytical data and validation reports for these soil samples are included in Appendix C. Following is a brief overview of the results.

### 2.2.2.1 Building 16

Results of soil sampling for PCBs in the vicinity of Building 16 are illustrated on Figure A-6 in Appendix A and summarized in Table B-5 in Appendix B. Values listed in boldface type in Table B-5 indicate samples in which total PCB concentrations exceed the cleanup goal of 0.94 mg/kg. PCBs were detected at concentrations greater than 0.94 mg/kg in soil samples collected in the unpaved area and below paving immediately west of the building slab, and beneath the north and south ends of Room 101 at the south end of the building. The extent of the PCB contamination greater than the cleanup goal to the south of Building 16 could not be delineated due to the presence of subsurface high-voltage electrical utilities just south of the building. West of the building slab, the detections exceeding the cleanup goal were generally limited to shallow soil (less than approximately 2 feet depth). PCBs were not detected at concentrations greater than 0.94 mg/kg in the unpaved areas southwest or east of the building. PCB concentrations were less than 50 mg/kg in all samples except for two locations west of Room 110. At these locations, the shallowest samples contained 52 and 135 mg/kg total PCBs, and concentrations declined to levels less than the cleanup goal at a depth of 1 foot (see Figure A-6 in Appendix A).

Soil samples collected beneath the building slab (including where sediment was contaminated with PCBs as discussed above) did not contain PCBs at concentrations greater than 0.94 mg/kg, except beneath Room 101 at the southern end of the building. Samples collected from the upper one or two feet of soil beneath the southern portion of Room 101 contained less than 0.94 mg/kg of PCBs. However, below these depths, samples collected at six locations in this area had PCB concentrations exceeding 0.94 mg/kg up to 2 feet below ground surface. These data suggest that PCBs may have been released in this area before Room 101 was constructed in the 1970s as an addition to Building 16, and that relatively uncontaminated soil was placed on top of the release area. In addition to the contamination detected at the southern end of Room 101, samples collected from beneath a sump at the north end of Room 101 (B16-SD-069) contained 2.0 and 1.4 mg/kg at 0.5 and 1.0 feet, respectively. PCB concentrations were less than the cleanup goal in deeper samples (from 2 to 4 feet) at this location (Appendix A, Figure A-6).

#### **2.2.2.2 Building 16A**

Results of soil sampling for PCBs in the vicinity of Building 16A are shown on Figure A-6 in Appendix A and summarized in Table B-5 in Appendix B. PCBs were not detected at concentrations exceeding 0.94 mg/kg in soil beneath the building or in the surrounding area.

### **2.3 Groundwater**

LBNL has periodically sampled groundwater at the Site for PCBs and has detected no PCBs in groundwater (see Table 1).

In February 2015, a comprehensive investigation was conducted to assess whether the PCBs detected in soil at the Site had affected groundwater. Groundwater samples collected from 15 monitoring wells at the Site and downgradient areas were analyzed for PCBs using EPA Method 8082. No PCBs were detected in any of the samples (detection limit of 0.5 µg/L) (LBNL, 2015e; Appendix D). The absence of PCBs in Site groundwater is consistent with the low solubility of PCBs and their high sorption to soil.

Locations of the wells sampled for PCBs are shown in Figure 8, along with the locations at which PCBs were detected in soil at the Site, and the inferred groundwater flow directions.

**Table 1. Historical Results of Groundwater Monitoring  
at the Old Town Demolition Project Area**

Well Number	Sampling Date	Result <sup>(a)</sup>	Detection Limit
MW5-93-10	2/11/2015	ND	0.5 µg/L <sup>(b)</sup>
MW7-92-16	2/11/2015	ND	0.5 µg/L
MW16-94-13	6/10/1998	ND	0.2 µg/L
	5/28/1999	ND	0.2 µg/L
	9/12/2000	ND	0.2 µg/L
	9/12/2001	ND	0.2 µg/L
	9/4/2002	ND	0.2 µg/L
	8/20/2003	ND	0.2 µg/L
	2/11/2015	ND	0.5 µg/L <sup>(b)</sup>
MW16-95-3	2/11/2015	ND	0.5 µg/L <sup>(b)</sup>
MW52-93-14	4/11/2000	ND	0.3 µg/L
MW52-95-2B	2/10/2015	ND	0.5 µg/L <sup>(b)</sup>
MW52A-98-8B	2/10/2015	ND	0.5 µg/L <sup>(b)</sup>
MW52B-95-13	12/22/1998	ND	0.2 µg/L
	9/14/2000	ND	0.2 µg/L
	9/17/2003	ND	0.2 µg/L
	8/17/2004	ND	0.2 µg/L
	8/23/2007	ND	0.2 µg/L
	2/12/2015	ND	0.5 µg/L <sup>(b)</sup>
MW53-93-9	2/11/2015	ND	0.5 µg/L <sup>(b)</sup>
MW53-96-1	2/11/2015	ND	0.5 µg/L <sup>(b)</sup>
MW90-2	2/11/2015	ND	0.5 µg/L <sup>(b)</sup>
MW91-9	2/11/2015	ND	0.5 µg/L <sup>(b)</sup>
EW7C-04-2	2/10/2015	ND	0.5 µg/L <sup>(b)</sup>
SB7-97-1	2/12/2015	ND	0.5 µg/L <sup>(b)</sup>
SB16-97-11	4/7/2000	ND	0.2 µg/L
	5/16/2001	ND	0.2 µg/L
	3/26/2002	ND	0.2 µg/L
	3/5/2003	ND	0.2 µg/L
	3/8/2004	ND	0.2 µg/L
	3/21/2005	ND	0.2 µg/L
	2/12/2015	ND	0.5 µg/L <sup>(b)</sup>
SB16-98-1	3/22/1999	ND	0.5 µg/L
	6/16/1999	ND	0.2 µg/L
	10/17/2000	ND	0.2 µg/L
	10/3/2001	ND	0.2 µg/L
	3/22/2002	ND	0.2 µg/L
	9/30/2002	ND	0.2 µg/L
	9/17/2003	ND	0.2 µg/L
	9/13/2004	ND	0.2 µg/L
	2/12/2015	ND	0.5 µg/L <sup>(b)</sup>

(a) Aroclors: 1016, 1221, 1232, 1242, 1248, 1254, and 1260

(b) Aroclor 1221 detection limit is 1.0 µg/L

ND: No PCBs detected.

2 to 3 feet, indicating limited vertical migration of PCBs in the soil. The PCB distribution at the sump at Building 52 shows high PCB concentrations (greater than 100 mg/kg) at depths from 1 to 8 feet below the ground surface, decreasing to non-detectable levels below a depth of 12 feet (see boring SB52-14-20 on Figures A-1 and A-2). The location of this release, beneath a broken pipe exiting the sump, suggests that continued leaking of liquids from the sump enhanced the downward leaching of these liquids through the soil column and therefore may have distributed the PCBs at this location to a greater depth than has been observed elsewhere. The contact between artificial fill and underlying low permeability Orinda Formation bedrock was encountered at approximately 13 feet below ground surface at this location, and likely limited the downward migration of the PCB release.

Similarly, although PCBs were detected at a concentration greater than 100 mg/kg in the surface sample at a location west of the southern end of the building (see SB52-14-43 in Figure A-2), the PCB concentrations at this location decreased to less than the cleanup goal of 0.94 mg/kg between 3 and 6 feet below ground surface, also indicating limited vertical migration.

Erosion of surface soil impacted with PCBs and weathering of exterior building materials containing PCBs (*e.g.*, paint) may have resulted in the migration of suspended sediment containing PCBs to the storm drain system and to areas located topographically below the buildings as indicated by elevated PCB concentrations downslope of apparent release points shown in Figures A-2 and A-6.

Cosolvency is not a significant transport mechanism for PCBs at the Site as indicated by the limited vertical extent of PCBs in the soil and the absence of PCBs in the groundwater (see Section 2.3). As described above, although PCBs had been released to soil over many decades, the vertical extent of the contamination is generally limited to the upper 2-3 feet of soil. If PCB mobility had been increased at the Site due to cosolvency, a greater vertical distribution of PCBs should be observed, given that the PCB releases were not from recent spills. Even if cosolvency were a factor in the mobility of the detected PCBs, it would not affect the methodology for cleanup proposed in this plan.

### 3 RISK SCREENING

The potential risk to human and ecological receptors from exposure to PCBs in soils at the Site was evaluated to develop a Site cleanup level that is protective of human health and the environment.

#### 3.1 Data Inputs

Analytical results show that PCBs in concrete and soil at the Site are almost exclusively composed of Aroclors 1254 and 1260, with the exception of one soil sample that reportedly contained Aroclor 1242 and one detection of Aroclor 1268 (see Section 2 and Appendix B).

EPA Region 9 has developed an RSL and a calculator for obtaining a site-specific screening level for “high risk Aroclors,” which are defined by the EPA as the sum of concentrations of Aroclors 1221, 1232, 1242, 1248, 1254, 1260, and 5460 (EPA, 2015d). Because high risk Aroclors have been detected in concrete or soil at the Site, the RSL for high risk Aroclors is an appropriate cleanup goal.

Fresh water ecological toxicity reference values for total PCBs developed as part of an *Ecological Risk Assessment for Chemicals* (ERAC) (LBNL, 2002) were used to evaluate impacts to potential ecological receptors impacted by storm water runoff from the Site. The ERAC sourced the total PCB toxicity reference values for threshold effect concentration (TEC) and probable effect concentration (PEC) from consensus-based sediment quality guidelines (MacDonald, 2000). The ERAC TEC and PEC for total PCBs are consistent with the current values listed in the National Oceanic and Atmospheric Administration Screening Quick Reference Tables (NOAA, 2015).

#### 3.2 Human Health Exposure Assessment

Figure 13 is a conceptual site model showing the primary and secondary PCB release mechanisms at the Site and potential human exposure pathways. Although no documentation of PCB releases is available for the Site, the primary release mechanisms are hypothesized to be historical spills and releases of PCB-bearing oils from such equipment as transformers, capacitors, and vacuum pumps, and from the weathering and degradation of PCB-containing building materials. As posited in the conceptual site model, the released PCB oils are initially contained in soil, concrete, and sediment, and then may be released to air (as suspended dust particles), storm water, and groundwater. Human exposure may occur through contact with any of this media. As shown on Figure 13, no human receptors are exposed to edible biota, as the creeks near LBNL are too small to support fish populations suitable for recreational or subsistence harvesting.

For the human health exposure assessment, no residential exposure is assumed, as there are no long-term residents at the Site and no plans to house such residents. As discussed in Section 1.4, the LBNL Guest House is occupied by guests doing business at LBNL or UC Berkeley. While these guests spend the night at the Facility, their exposure is generally consistent with an indoor office worker except that their exposure durations and frequencies would be substantially lower (Table 2). Therefore, the screening evaluation of the indoor office worker’s exposure will be protective of the occupants of the Guest House. The nearest off-site residential receptors are located more than 1,500 feet from the Site. Recreational exposure is also excluded, as access to the LBNL facility is controlled and only business-related activities are permitted.

Outdoor, indoor, indoor and outdoor (composite), and construction workers are identified as receptors that have potential future exposure to residual PCBs in Site soils.

## **4 CLEANUP PLAN**

This section addresses the cleanup of PCB remediation waste, mainly of concrete and soil, at the Site.

### **4.1 Cleanup Goals**

As discussed below, consistent with the requirements of Section 761.61 (c), the cleanup will reduce PCB concentrations at the Site to levels that are protective of human health for receptors described in Section 3.4, as well as ecological receptors and groundwater quality. Per Section 761.61 (c)(2), the means and methods included in this cleanup plan are designed so that their implementation will not pose an unreasonable risk of injury to health or the environment. The goals for protection of human health, ecological receptors, and groundwater quality are described below.

#### **4.1.1 Protection of Human Health**

The objective of this cleanup plan is to provide requirements for reducing worker excess cancer risk to levels equal to or less than  $1\text{E-}06$ . Based on the risk screening presented in Section 3 above, a soil cleanup meeting the goal of 0.94 mg/kg total PCBs reduces risks to human health to this level. Building and concrete slab removal, and removal or capping of soil with PCB concentrations exceeding 0.94 mg/kg, would create conditions that are protective for workers at the Site. Soil removal is LBNL's preferred cleanup option since it is effective and implementable. A cap would be considered as an alternative, as discussed in Section 4.9, if site conditions were to preclude removal of PCB-contaminated soil (greater than 0.94 mg/kg of PCBs).

#### **4.1.2 Protection of Groundwater**

Current site conditions appear to be protective of groundwater, as indicated by the groundwater monitoring data and the estimated migration rates of PCBs in soil discussed in Section 2.5.2. Reduction of PCB mass or capping (if required) will further reduce the potential for future groundwater impacts. Therefore, the cleanup goal of 0.94 mg/kg is deemed protective of groundwater.

#### **4.1.3 Protection of Ecological Receptors**

As discussed in Section 3, ecological receptors potentially exposed to PCBs from the Site are limited to aquatic organisms exposed to storm water discharges from the Site. Available data for creek sediment potentially receiving these storm water discharges indicate that PCB concentrations only slightly exceed the TEC no-effects threshold (see Sections 2.4 and 3.5). Therefore, removal of concrete, sediment, and storm drains containing PCBs at concentrations exceeding 0.94 mg/kg and removal or capping of soil with PCB concentrations exceeding 0.94 mg/kg are expected to reduce or eliminate further migration of PCBs to creek habitat and therefore result in conditions that are protective for ecological receptors.

### **4.2 Delineation of Cleanup Areas**

Sampling results discussed in Section 2 above were used to identify areas where PCB concentrations in concrete or soil exceed 0.94 mg/kg (cleanup goal) and 50 mg/kg (for waste designation and disposal purposes). Based on the delineation of areas exceeding these thresholds, plans were developed for removal and disposal of concrete and soil from Buildings 52, 52A, 16, 16A, the electrical pad, and surrounding areas. Figures A-3 and A-7 in Appendix A illustrate the proposed extent of concrete removal, while Figures A-4 and A-8 illustrate the proposed extent of soil excavation. The details of the proposed

cleanup are described in Sections 4.2.1 and 4.2.2 below. Proposed cleanup methods are described in Sections 4.4 through 4.6. PCB remediation waste with PCB concentrations less than 50 mg/kg will be segregated from remediation waste with PCBs at concentrations greater than 50 mg/kg and disposed of as described in Section 5.

#### **4.2.1 Extent of Concrete Removal**

PCBs were detected in concrete at concentrations exceeding 0.94 mg/kg in most samples collected from the Building 52 slab, the electrical pad, and the Building 16 slab. Consequently, these slabs (except for trenches and sump discussed below) will be removed and disposed of as PCB remediation waste at a facility permitted, licensed, or registered by a state to manage municipal, non-municipal non-hazardous solid waste (Class II landfill) in conformance with Section 761.61(a)(5)(B)(2)(ii).

Waste from the following two locations will be disposed of at a hazardous waste landfill permitted by EPA under section 3004 of RCRA, by a state authorized under section 3006 of RCRA, or at a PCB disposal facility approved under Part 761:

1. Concrete from the utility trench in Room 109 of Building 52 with PCBs greater than 50 mg/kg, as shown in Figure A-1 in Appendix A (B52-SC-005), will be segregated from the rest of the slab.
2. The concrete sump at the end of a trench terminating on the western side of Building 52 shown in Figure A-3 will be excavated and disposed of as bulk PCB remediation waste with PCBs at concentrations equal to or more than 50 mg/kg, on the presumption that the concrete in the sump contains PCBs at concentrations greater than 50 mg/kg, since PCBs were detected in sediment at a concentration of 1,800 mg/kg, and in soil adjacent to the sump at a maximum concentration of 840 mg/kg. The floor of the trench leading to this sump had been removed in 2012, as discussed in Section 1.4.7.6 and shown on Figure A-1.

Approximately 1 foot of soil is expected to be removed incidental to the concrete slab removal. The soil is expected to be removed from directly beneath the slabs and from an area extending to approximately three feet beyond the slabs. Based on the analytical results, such soil will be disposed of with, and at the same facility, as the concrete.

Sections of retaining walls shown in Figure A-3 as the “Building 52/52A” and “Building 52A/Electrical Pad” retaining walls and in Figure A-7 as the “Building 16/16A Retaining Wall” will be removed. Samples of the “Building 52/52A” retaining wall are being collected to determine if the wall contains PCBs at concentrations greater than 50 mg/kg. Approximately one foot of soil from behind the retaining walls and one foot of soil from beneath the footings of these walls will be removed with the walls. The retaining wall sections and soil incidentally removed with the wall on the east side of Building 52, which contains PCBs at concentrations greater than 0.94 mg/kg but less than 50 mg/kg (see Figure A-3 of Appendix A), will be removed. The concrete and soil waste will be disposed as PCB remediation waste with less than 50 mg/kg of total PCBs (see Section 5). Although not currently slated for removal, sections of the “Building 16 West” retaining wall may also be removed if necessary. Concrete from this wall would either be sampled, or presumed to contain PCBs at concentrations greater than 50 mg/kg.

Shallow soil underneath the north end of the slab at Building 52A contains PCBs at concentrations greater than 0.94 mg/kg, but less than 50 mg/kg. The concrete on top of it will be removed for disposal along with the soil as PCB remediation waste with less than 50 mg/kg of total PCBs.

The concrete slab from Room 140 will be disposed of as remediation waste, although there is no reason to suspect that this concrete contains PCBs, since Room 140 was added to Building 16 in 1980 and no PCBs that could have impacted concrete were used in this room. However, one soil sample collected directly to

the west of this room contains PCBs at a concentration greater than the cleanup goal but less than 50 mg/kg. Hence, it is possible – although unlikely – that PCBs may have migrated beneath the concrete and impacted it.

#### **4.2.2 Extent of Soil Removal**

Soil will be excavated from areas within the project boundary where PCB concentrations in soil exceed 0.94 mg/kg. In addition, an area in the roadway to the west of Building 52, which is outside of the boundary, will be excavated. The areas and proposed depths of soil excavation are shown on Figures A-4 and A-8 in Appendix A. In general, PCB-impacted soil will be excavated to approximately the depth that corresponds to the shallowest soil samples that contain less than 0.94 mg/kg of total PCBs. Except where noted otherwise, all excavated soil will be disposed of as PCB remediation waste with less than 50 mg/kg of total PCBs at a facility permitted, licensed, or registered by a state to manage municipal, or non-municipal non-hazardous solid waste.

Soil from two areas shown on Figure A-2 and one area shown in Figure A-6 with more than 50 mg/kg total PCBs will be segregated during excavation for disposal at a hazardous waste landfill permitted by EPA under Section 3004 of RCRA, by a state authorized under Section 3006 of RCRA, or at a PCB disposal facility approved under Part 761.

The sump on the west side of Building 52 and the soil around and beneath it will be excavated to a depth of 13 feet or bedrock as shown on Figure A-4, whichever is encountered first. At the floor of the excavation the dimensions will be approximately 5 feet square. These dimensions will be maintained upward for no more than 5 feet. The upper eight feet of the excavation will be inclined to maintain slope stability. Figure A-4 illustrates the minimum outline of this excavation that can be expected. The actual extent of sloping will be determined in the field and will be dependent on soil type, soil moisture at the time of excavation, and the existing slope of the ground surface.

### **4.3 Site Setup**

DMS personnel will complete the activities discussed below prior to commencement of PCB cleanup activities. Overhead utilities have been identified and subsurface utilities located and marked. Safety and environmental protections will be implemented as discussed in Section 8.

#### **4.3.1 Physical Identification of Cleanup Areas**

Locations of soil characterization samples were marked and surveyed by a California-registered land surveyor to obtain coordinates in conformance with the UC grid system used by LBNL. The proposed excavation limits shown in Figures A-3, A-4, A-7 and A-8 are based on results of samples collected at these surveyed locations. Based on the sample locations, the boundaries of the cleanup areas shown in Figures A-3, A-4, A-7 and A-8 will be physically marked (with stakes, flags, or paint) to delineate the concrete and soil to be removed. Areas with PCB concentrations greater than 50 mg/kg will be marked (with stakes, flags, or paint) to ensure proper segregation of waste from these areas from waste generated in other locations.

A grid will be overlain on the excavation plan figure (Figure A-4 and A-8) and a corresponding grid will be marked in the field to facilitate location the areas to be excavation.

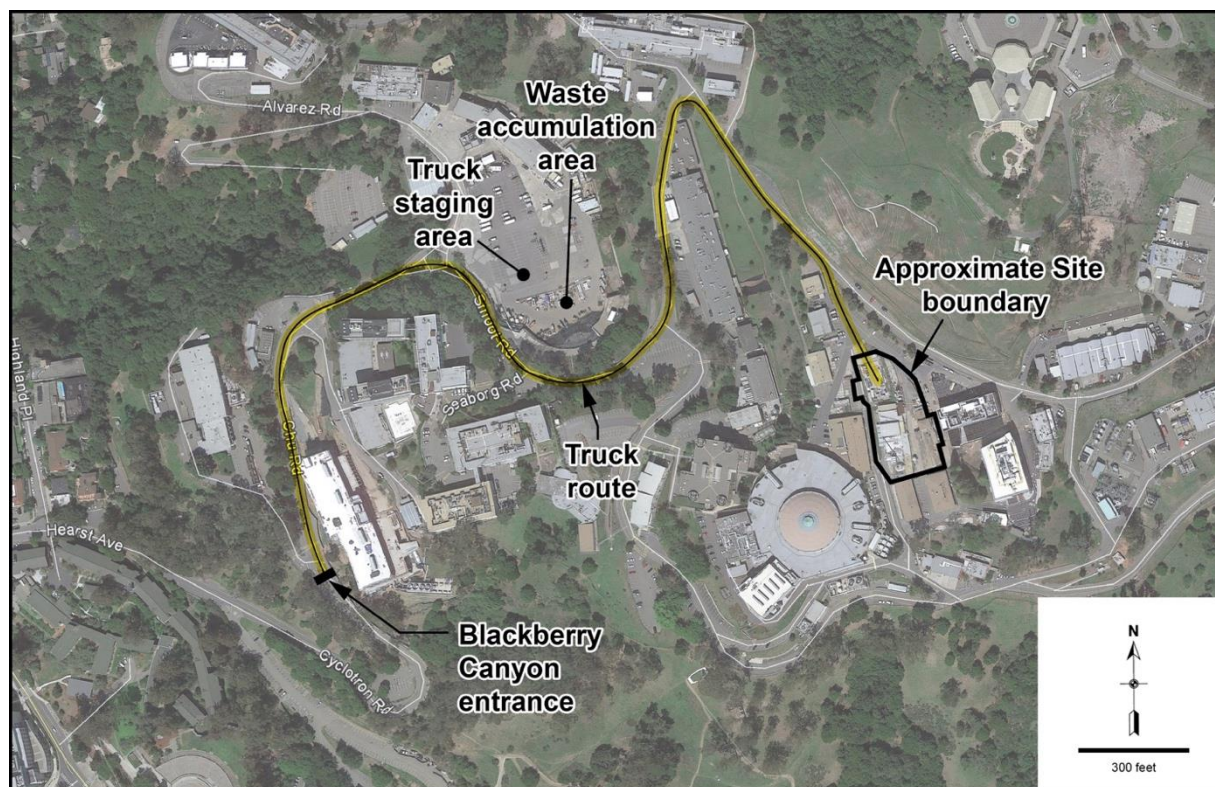
### 4.3.2 Site Access and Layout

The Site is located in the central part of the Facility. Equipment will access the Site through the Blackberry Canyon entrance shown on Figure 14. Trucks will be staged near the waste accumulation area, also shown in Figure 14, and will be dispatched to the Site via McMillan Road. Trucks will travel to the Site one at a time to reduce traffic congestion. A truck superintendent, stationed at the truck staging area, will be in contact with the excavation crew and will dispatch the trucks when the crew is ready to load waste into them. From McMillan Road, the trucks will enter and exit the Site at its northern end.

Waste bins and containers will be staged in the waste accumulation area and will be delivered to the Site when needed for waste loading.

Figure 15 illustrates the work area at the Site. The entire work area is designated as an exclusion zone. A secure equipment lay down yard and decontamination area will be located north of the Building 52 slab. Any segments of the truck route shown on Figure 15 that are not paved will be covered with gravel to reduce soil tracking.

**Figure 14. Travel Route to Old Town Project**



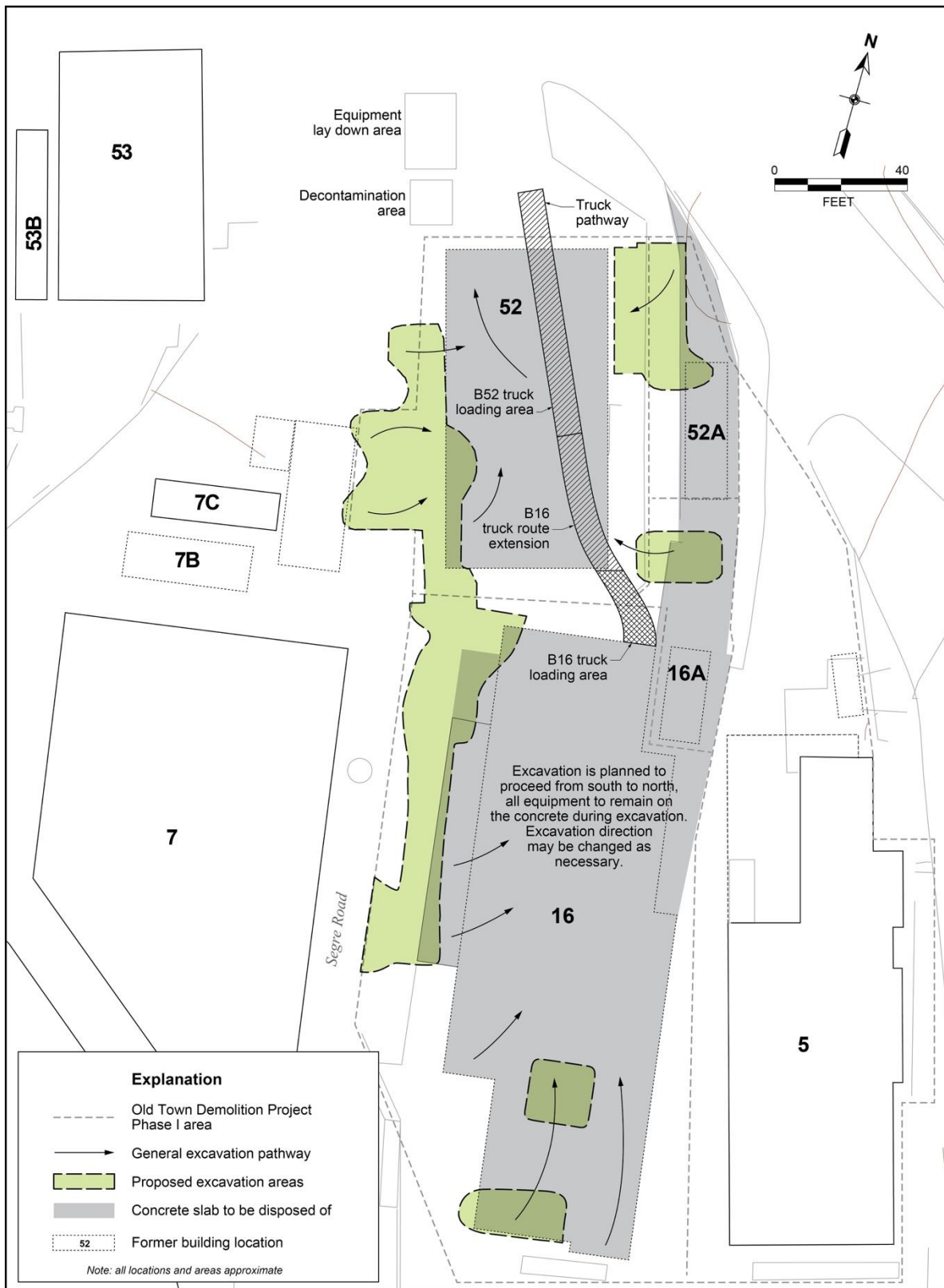


Figure 15. Excavation Site Layout

## 4.4 Concrete and Soil Removal

The cleanup of Buildings 52 and 52A and the electrical pad is planned to be completed before cleanup of Buildings 16 and 16A. However, it is possible that radiological contamination may have impacted the eastern side of Buildings 16 and 16A and a modification to this sequence may be required after a radiological assessment of this area has been completed. Other logistical constraints may also require changes to the sequencing. The protective measures described below will be incorporated into any modifications to the approach described.

Cleanup activities will be sequenced to utilize the Building 52 pad as an equipment staging and truck loading area during cleanup in this area, allowing work to proceed from south to north toward the equipment laydown and decontamination areas. After the Building 52 pad is removed and the excavations in that area have been backfilled, gravel will be placed through the area up to the north side of the Building 16 slab to allow trucks to back up to Building 16. Excavation equipment may also access the pads of Buildings 16 and 16A from the Building 5 yard. Equipment and vehicles will travel on the concrete or gravel, thereby reducing contact with soils.

Concrete removal and soil excavation work will be preceded by exposing known subsurface utilities. Subsurface utilities will be examined, sampled if necessary, and managed as described in Section 4.5.

Removal of the concrete slabs and soil will be conducted with an excavator fitted with any of the following tools, or others, as needed:

- **Processor:** A toothed concrete crushing attachment will be used to crush concrete into small pieces.
- **Breaker:** A large “chipper” will be used to chip concrete.
- **Jackhammer (or equivalent demolition tool):** A percussion tool that will be used to break up concrete.
- **Excavator bucket (with or without a “thumb”):** The bucket will be used to scrape up concrete debris and pick it up for loading into trucks or bins. If necessary to manage the concrete, a thumb can be attached to the bucket to facilitate picking up pieces of concrete. The bucket (without thumb) will be used to scrape or excavate soil and place it into trucks or bins.
- **Soil loader:** A loader will be used to facilitate transfer of material onto trucks or into bins.

Concrete and soil with PCBs at concentrations greater than 0.94 mg/kg and less than 50 mg/kg will be directly loaded into end-dump trucks with 10- to 14-yard capacity fitted with disposable bed liners. The trucks will be covered, and the covers secured, before departing from the Site.

Concrete and soil with PCBs at concentrations greater than 50 mg/kg will be placed in lined bins conforming to the specifications of the Department of Transportation (DOT). The bins will be closed and transported to the waste accumulation area for consolidation prior to shipment for disposal.

Before the excavator transitions from work in an area with PCBs at 50 mg/kg or greater to an area with less than 50 mg/kg of PCBs, the excavator bucket or other attachment (and other equipment) that may have been in contact with the contaminated soil will be cleaned as described in Section 4.8.2 (except that wipe samples will not be collected).

After all concrete and soil is removed per the excavation plan described in Section 4.2, verification sampling will be conducted as described in Section 6. All open excavations and areas of exposed soil that

may be contaminated will be managed in accordance with the requirements specified in Section 8 to ensure that workers and the environment are protected.

If verification sampling indicates that PCBs remain in soil at concentrations greater than 0.94 mg/kg, removal of additional soil may be required, or other options to protect human health and the environment will be evaluated. If the areal extent of the elevated PCBs appears uncertain, it may be necessary to collect additional characterization data to determine how much to expand the excavation footprint. If additional soil characterization is required, soil samples will be collected (typically) within approximately 10 feet laterally and one foot vertically of the samples that show PCB concentrations greater than 0.94 mg/kg. Samples will be collected as described in Section 7 of this document.

If additional soil must be removed, the excavator will be remobilized and the impacted soil excavated and disposed as described above. After completion of all excavation work, the equipment will be decontaminated as described in Section 4.8.

## **4.5 Removal of Storm Drain System Components and Utilities Potentially Impacted by PCBs**

Storm drain system components, including pipes and inlets, within the Site will be removed as shown in Figures A-4 and A-8 in Appendix A. Any segments that remain will be sampled as described in Section 7.4 and capped or plugged at the inlet and outlet.

Other underground utilities, such as sewer pipes, electrical conduit, and waste oil pipes are likely to be encountered during concrete demolition and/or soil excavation. Some subsurface utilities will be left in place. If these utilities are exposed, they will be examined and evaluated for potential contamination. If contamination is suspected, sampling will be conducted as described in Section 7.4. If liquids are found, they will be sampled as described in Section 7.3. Analysis for PCBs will be conducted as described in Section 9. Damaged or contaminated subsurface utilities that are to remain in place will be replaced or repaired.

Underground piping will be excavated in a manner that prevents the release of potentially contaminated liquids or sediments to the environment, which are likely to be concentrated in sags, joints, bends, and traps. Removal of the piping will be in accordance with the *General Process for the Excavation and Removal of Potentially Contaminated Underground Piping* (LBNL, 2014c), the requirements of which are included herein. The piping will be exposed to allow for:

- Visual observation of the pipe to identify any damage or defects that could have allowed releases to the environment.
- Assessment of whether the soil around the pipe is contaminated.
- Characterization of piping and contents for waste management purposes.

Once the pipe is exposed, the following procedure will be followed to determine if liquid, sediment, or other loose material is present in the pipe and/or the surrounding soil is contaminated.

1. Soil will be cleared from all sides of the pipe so that it is completely visible;
2. Pipes will be inspected for cracks, holes, joint separation, or any other obvious damage that could allow an environmental release and these locations will be marked. Soil beneath any such defect will be sampled and analyzed for PCBs per Sections 7 through 10;

3. Pipes will be evaluated for potential PCB-containing materials. Openings such as at floor drains, cleanouts, or manholes exposed during demolition will be examined for the presence of liquids or sediment. If liquids or sediment are observed, samples will be collected and analyzed for PCBs per Sections 7 through 10;
4. Soil surrounding the pipe will be inspected for discoloration, unusual smells, liquids or other evidence of potential contamination. If potential contamination is identified, soil samples will be collected and analyzed for PCBs per Sections 7 through 10;
5. If liquid is present in the pipes, it will be removed and, while analytical results are pending, placed in a properly labelled container that meets DOT specifications for liquid PCB remediation waste (see Section 5.1.3) and transferred to the Waste Accumulation Area described in Section 5.3.2.

Once the pipes are cleared of liquids, the following process will be followed to remove the underground piping.

1. A plastic-covered lay-down area will be established onto which the piping system components will be placed prior to handling or transfer.
2. A controlled work area will be established around the pipe excavation to prevent the migration of potential contaminants from the work site into the soil or storm drains.
3. Plastic sheeting or other containment will be placed under the pipe section to be exposed such that any residue that may accidentally spill from the pipe as it is cut, repaired, removed or capped will be captured and collected.
4. The pipe will be cut or snapped (for cast iron pipes) and removed and placed in the lay-down area.
6. Once removed, the pipes will be transferred to labelled 55-gallon drums or other appropriate containers that meet DOT specifications for the waste (see Section 5.3.1). Pipes determined to be to be potentially contaminated (*e.g.*, storm or sewer pipes) will be sampled and analyzed for PCBs in accordance with Sections 7 through 10 or presumed to contain PCBs at concentrations greater than 50 mg/kg.
7. Pending analysis, the containers will be stored in the waste accumulation area (Section 5.3.2).

## 4.6 Removal of Other Subsurface Materials

Unanticipated materials or features, such as tanks, may be encountered during slab demolition and soil remediation. Additional characterization of these materials may be required to assess the potential presence and concentrations of PCBs. Such characterization will be conducted *in situ* in accordance with the sampling methodology outlined in Sections 7 through 11. If materials are encountered which require sampling by a methodology not specified in this cleanup plan, the sampling will be conducted in accordance with the *Sampling and Analysis Plan for PCBs – Above Slab Building Characterization Old Town Phase I Demolition* (DMS, 2015b), which provides sampling protocols for concrete, metals, painted surfaces, insulation, wall forming materials, electrical cable insulation, and other materials. If these materials contain PCBs, they will be removed in a manner that prevents the spread of PCB contamination and placed in appropriate containers as required in Section 5.3.1. Any areas subject to soil remediation based on additional soil characterization will be subject to verification sampling as described in Section 6.

## 4.7 Backfilling and Site Restoration Activities

Upon acceptance of verification sampling by LBNL, DOE, and EPA as described in Section 6.3, excavations will be backfilled with clean soil. Prior to backfilling, the boundaries and depths of all excavations and the locations of all verification soil sample locations will be surveyed by a California licensed land surveyor. The survey will be performed using UC grid coordinates. The post-processing accuracy of the survey will be plus or minus 0.1 foot (horizontal and vertical).

Backfill soil will be obtained from the LBNL borrow area or from an off-site source. All backfill soil will be analyzed for PCBs, in addition to other constituents, such as metals. Backfill soil will be brought to the Site in a dump truck and placed in the excavation using a small bulldozer. Soil will be compacted using a compactor. If needed to meet compaction specifications, the soil will be conditioned by light misting with water prior to compaction. Compaction testing will be performed utilizing a nuclear density gauge under oversight of a geotechnical engineer. Compaction under roads and former building foundations will meet 95 percent per LBNL specifications. Compaction in other areas will be 90 percent. The geotechnical engineer will provide soil compaction curves and the results of compaction testing. This documentation will be presented in the cleanup completion report described in Section 12 and retained in the project records as described in Section 14.

## 4.8 Equipment Decontamination

All non-disposable equipment that comes into contact with materials contaminated with PCBs will be decontaminated. Non-disposable equipment will be decontaminated prior to each use. Disposable equipment intended for one-time use will not be decontaminated, but will be packaged for appropriate disposal per Section 5.

### 4.8.1 Decontamination of Sampling Equipment, Hand Tools, and Miscellaneous Small Items

Sampling equipment, hand tools, or other small items will be decontaminated in accordance with Section 761.79 (c)(2). Lightly contaminated tools may be decontaminated by swabbing surfaces with hexane, provided by the analytical laboratory in a squeeze bottle. A paper towel moistened with hexane will be used for cleaning equipment surfaces that came into contact with potential PCB-containing material.

Heavily contaminated equipment will be decontaminated as follows:

1. Assemble two decontamination buckets. The first bucket contains a detergent and potable water solution, and the second bucket is for rinsate.
2. Place all used equipment (*e.g.*, drill bits, hose for the vacuum cleaner, and utensils) in the detergent and water bucket.
3. Scrub each piece thoroughly using the scrub brush. Any powder clinging to metal surfaces should be carefully removed, especially from the twists and curves of drill bits.
4. Next, rinse each piece with water and hexane.
5. Place the rinsed pieces on clean paper towels and individually dry and inspect each piece. Note: all pieces should be dry prior to reuse.

## 4.8.2 Decontamination of Large Equipment

The excavator with attachments listed in Section 4.4, as well as the soil loader, will be used to remove PCB-contaminated soil and concrete and will require decontamination prior to being removed off-site, being used in areas that are not contaminated, or moved from highly contaminated areas (*e.g.*, with PCBs greater than 50 mg/kg) to less contaminated ones.

During cleanup activities, to the extent possible, the operators will assure that only the bucket or other attachments will come in contact with impacted concrete and soils. Efforts will be made to avoid contact of the excavator tracks, undercarriage, or excavator arm with contaminated concrete and soils.

After removal of soil and debris from the equipment and sweeping of the excavation area, the equipment will be moved to the decontamination area. The buckets and the attachments, and, if necessary, other parts of the equipment will be decontaminated over a washing container or a bermed containment pad large enough for the equipment compatible with the cleaners used. The decontamination will be conducted in accordance with Sections 761.79 (c)(2)(i) and 761.375 as follows:

1. **First wash:** Cover the entire surface with concentrated or industrial strength detergent or non-ionic surfactant solution. Contain and collect all cleaning solutions for proper disposal. Scrub rough surfaces with a scrub brush or scrubbing pad, adding cleaning solution such that the surface is always very wet, such that each 900 cm<sup>2</sup> (1 square foot) is washed for 1 minute. Wipe smooth surfaces with a cleaning solution-soaked disposable absorbent pad such that each 900 cm<sup>2</sup> (1 square foot) is wiped for 1 minute. Wash any surface greater than 1 square foot for 1 minute. Mop up or absorb the residual cleaner solution and suds with a clean disposable absorbent pad until the surface appears dry. This cleaning should remove any residual dirt, dust, grime, or other absorbent materials left on the surface during the first wash.
2. **First rinse:** Rinse off the wash solution with 1 gallon of clean water per square foot and capture the rinse water. Mop up the wet surface with a clean, disposable, absorbent pad until the surface appears dry.
3. **Second wash:** Cover the entire surface with hexane or other organic solvent in which PCBs are soluble to at least 5 percent by weight. Contain and collect any runoff solvent for disposal. Scrub rough surfaces with a scrub brush or disposable scrubbing pad and solvent such that each 900 cm<sup>2</sup> (1 square foot) of the surface is always very wet for 1 minute. Wipe smooth surfaces with a solvent-soaked, disposable absorbent pad such that each 900 cm<sup>2</sup> (1 square foot) is wiped for 1 minute. Any surface greater than 1 square foot shall also be wiped for 1 minute. Wipe, mop, and/or sorb the solvent onto absorbent material until no visible traces of the solvent remain.
4. **Second rinse.** Wet the surface with clean rinse solvent such that the entire surface is very wet for 1 minute. Drain and contain the solvent from the surface. Wipe the residual solvent off the drained surface using a clean disposable absorbent pad until no liquid is visible on the surface.

The following will be recorded in a bound field logbook for decontamination of all equipment: description of the equipment decontaminated, a description of the estimated level of contamination, the date and time of the decontamination, names of persons conducting the decontamination process, detergents and solvents used in the process and a signed certification from the field superintendent that the above stated process was properly followed. These records will be managed according to the requirements described in Section 14.2.

The steps described above are consistent with the self-implementing procedure in Section 761.79(c)(2)(i) and no sampling is required to confirm adequate decontamination if this process is followed. As an alternative, the process may be modified as follows, if sampling is conducted to confirm adequate decontamination: the second wash and rinse may be conducted using a concentrated or industrial strength detergent or non-ionic surfactant solution instead of an organic solvent if followed by collection of wipe samples to confirm that the decontamination has been successful. Approval of this alternative is hereby requested per Section 761.79(h).

The wipe sample collection will be performed per Section 761.123 and the wipe sampling procedure enclosed in Appendix E. Prior to excavation activities, the dimensions of the excavator and loader buckets, undercarriage, tracks, arm, and attachments will be obtained to determine the number of samples required to confirm that the equipment has been adequately decontaminated. Samples will be collected to represent 1 square meter of the surface area of the equipment. Sample locations will be selected to represent locations with the greatest likelihood of contamination (*i.e.*, the inner surface of the excavator bucket, near the teeth, metal in contact with soil or concrete). If the surfaces do not meet the cleanup level of less than 10 micrograms per 100 square centimeters (10 µg/100 cm<sup>2</sup>), such surfaces will be re-cleaned and resampled as described above.

Pending results from the wipe sampling, the bucket and other attachments will be detached from the excavator or loader and stored in the equipment lay down area on, and covered with, clean plastic sheeting.

Decontamination rinsate will be treated, along with storm water and groundwater removed from excavations, to remove PCBs and other contaminants before it is discharged to the sewer in accordance with a special discharge permit from EBMUD. Prior to discharge, the wastewater will be sampled and analyzed for PCB congeners and will only be discharged if the discharge limit of 0.017 µg/L required by the permit can be met (see Section 5 and Appendix G).

Solids or sludge generated from decontamination activities will be sampled and analyzed for PCBs per Sections 7 through 10 or presumed to contain PCBs at concentrations greater than 50 mg/kg (see Section 5 for characterization of multiphasic waste). This waste will be placed in 55-gallon drums or other appropriate containers meeting the DOT specifications for this type of waste and will be transferred to the waste accumulation area described in Section 5.3.2.

#### **4.8.3 Decontamination of Wastewater Treatment System**

The decontamination wastewater system includes various elements, including large equipment (21,000-gallon water storage tanks), smaller equipment (200-300 gallon totes, carbon filter housings, pumps) and disposable elements (hoses, filters and carbon filter media) as shown in the schematic drawing provided with the permit in Appendix G. The disposable elements will be sampled and disposed according to Table 4 in Section 5.

Smaller elements of the wastewater treatment system will be decontaminated as described in Section 4.8.1. Larger pieces of equipment such as the tanks and totes will be decontaminated as described in Section 4.8.2 with one exception. Any sediment and sludge accumulated in the 21,000-gallon holding tanks will be removed (see Section 5.1) and the tanks will be washed and rinsed. Wipe samples will be collected at accessible locations that are expected to be most contaminated, such as the fluid outlet at the bottom of the tank where solids will collect. Two wipe samples will be collected within a one-square-meter area around the outlet.

## **4.9 Contingency Approach for Managing Unanticipated PCB Contamination**

Unanticipated PCB contamination may be discovered during the cleanup. Such contamination will be managed as discussed below.

### **4.9.1 Cleanup beyond Designated Cleanup Area**

If new areas of PCB contamination beyond the cleanup area delineated as described in Section 4.2 above were to be identified as a result of characterization activities included in this cleanup plan (*e.g.*, beneath building slabs, during removal of underground utilities, etc.), LBNL may proceed with removal of the contaminated soil or debris, provided that verification sampling is conducted in a manner consistent with Section 6.3.

### **4.9.2 Inaccessible Areas**

If areas identified in this plan as requiring cleanup are found to be inaccessible, LBNL will provide to EPA a written summary of the conditions that preclude access to the area for cleanup prior to ceasing work in the general vicinity. After EPA's concurrence, a land surveyor licensed in California will survey the inaccessible area boundary using the UC grid system. The inaccessible area will be demarcated from the area(s) that have been cleaned up by a permeable geotextile, such as Tencate Mirafi N-Series nonwoven polypropylene geotextile or similar. The geotextile will be installed along the side(s) and/or bottom of the excavation in the areas at which the excavation could not be completed.

If required to protect human health and/or the environment and feasible, LBNL may permanently cap the inaccessible area(s) (see Section 4.9.4), implement alternative institutional or engineering controls, or develop a final cleanup approach for submittal to EPA as an addendum to this cleanup plan. The surveyed locations of the inaccessible areas will be documented in the Cleanup Completion Report. Institutional controls discussed in Section 13 may be required to manage such areas.

### **4.9.3 Temporary Fencing or Capping**

Temporary fencing or capping may be required if a significant project delay were to prevent completion of the cleanup and conditions were to require isolation of the cleanup areas or portions thereof to protect human health and/or the environment. Fencing will be used in areas with residual PCB concentrations of less than 50 mg/kg.

Any fences installed will be designed to prevent unauthorized access to the impacted area and signage stating that unauthorized access is prohibited would be posted. Fencing will be installed in combination with storm water BMPs required to prevent sediment entrained in storm water runoff from leaving the contaminated area(s). The areas will be inspected weekly to ensure that BMPs are in place and remain protective of human health and/or the environment.

Should cleanup in areas where residual PCB concentrations exceed 50 mg/kg be temporarily suspended, a temporary cap will be installed. The performance objective for the temporary cap will be to prevent human exposure, infiltration of water, and dispersion of contaminated soils via wind and water erosion. LBNL and its contractor will specify materials for that cap that would meet the performance objectives. The cap will be maintained for the expected duration of the delay. The temporary cap will be inspected weekly, and any defects will be documented and repaired in a timely manner. Repairs will be required to begin within 72 hours of discovery of any breaches that could impair the integrity of the cap.

#### **4.9.4 Permanent Capping**

While permanent capping is not anticipated, if permanent capping were installed it must conform to the requirements of Section 761.61(a)(7). Consistent with this section, the cap shall consist of asphalt or concrete at least 6 inches thick, or soil at least 10 inches thick. Per Section 761.61(a)(7), the cap “must be of sufficient strength to maintain its effectiveness and integrity during the use of the cap surface which is exposed to the environment.” The cap shall be inspected regularly and repairs shall begin within 72 hours for any breaches that would impair the integrity of the cap.

Additionally, the cap must meet the closure and post-closure requirements included in 40 CFR 264.310(a) which include:

1. Providing long-term minimization of migration of liquids through the closed landfill.
2. Functioning with minimum maintenance;
3. Promoting drainage and minimize erosion or abrasion of the cover.
4. Accommodating settling and subsidence so that the cover’s integrity is maintained.
5. Having a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

The cap must also comply with permeability, sieve, liquid limit, and plasticity index parameters in Section 761.75(b)(1)(ii) through (b)(1)(v).

A deed restriction may be required to be recorded should a permanent cap be installed for protection of human health and the environment. The specific requirements for such a deed restriction are discussed in Section 13.

#### **4.10 PCBs Exceeding the Cleanup Goal Extending beyond the Old Town Phase I Boundary**

Site soil data illustrated in Figures A-2 and A-6 in Appendix A show that PCBs are present at concentrations greater than the cleanup goal in at least two locations beyond the Old Town Phase I boundary and cleanup area within it, which is subject to this plan (see Section 1.3 above): in the area north of the Building 52A slab and in the roadway to the west of Building 52. Removal of the contaminated soil at these locations is addressed in Section 4.2. The cleanup at these locations may be conducted during Phase I of the Old Town Demolition Project or at a future date.

It is possible that sampling triggered by unanticipated conditions encountered during demolition or verification sampling will indicate that PCBs at concentrations greater than the cleanup goal extend beyond the project boundary in locations other than those identified in this cleanup plan. LBNL will work with EPA to decide on a course of action regarding cleanup of such locations. Depending on factors such as the nature and extent of such contamination, availability of funding, and schedule considerations, the current cleanup scope may be expanded to include cleanup of these areas, or the cleanup may be conducted as a future phase or a separate project. Procedures described below would be implemented to ensure that such residual contamination can be reliably located and addressed in the future.

#### **4.10.1 Boundary Survey**

If residual PCBs at concentrations greater than the cleanup goal beyond the project boundary are not addressed during Phase I, the impacted area outside the project boundary, to the extent known, will be surveyed by a California-licensed land surveyor using the UC grid system prior to backfilling. The boundary survey results will be included in the cleanup completion report.

#### **4.10.2 Physical Barriers**

If clean fill is placed in a cleaned up area adjacent to a contaminated area that lies beyond the project boundary, the contaminated soil will be separated from the clean backfill using a permeable geotextile (Tencate Mirafi N-Series nonwoven polypropylene geotextile or similar). The location and specifications of the permeable geotextile will be documented in the cleanup completion report

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## 5 WASTE MANAGEMENT

PCB-containing waste generated during demolition of the building slabs and soil cleanup at the Site will be segregated from non-PCB wastes and disposed of in conformance with the requirements of TSCA and the California Hazardous Waste Control Law codified in Division 4.5 of Title 22 of the California Code of Regulations (CCR). Four general categories of PCB remediation waste defined in Section 761.61(a)(4) may be generated during the cleanup: 1) bulk PCB remediation waste, including sediment, and soil; 2) materials with non-porous surfaces, such as steel pipes; 3) materials with porous surfaces, such as concrete, wood, and clay; and 4) liquids. Characterization and disposal requirements for these wastes are discussed below.

### 5.1 Waste Characterization

Sample data collected prior to demolition of the building slabs and soil cleanup (see Section 2) to represent “as found” site conditions will be used to characterize PCB remediation waste for off-site disposal. This waste includes concrete, soil, and other bulk debris. Any such waste that has not been pre-characterized and is encountered during demolition will be characterized *in situ*, as discussed in Sections 4.4 through 4.6; in accordance with the field sampling methods specified in Section 7 and analytical procedures specified in Section 9. Bulk samples will be collected and analyzed for PCBs from any potentially PCB-impacted porous materials. Wipe samples will be collected from any potentially PCB-impacted non-porous materials discovered.

PCB-containing liquid waste generated during demolition and cleanup will include decontamination solvents, decontamination water, and/or other fluids that may have come into contact with PCBs in concrete, soil, pipes, or other materials. These fluids will be characterized in accordance with field methods described in Section 7 and analytical procedures specified in Section 9 for liquid samples.

Storm water and groundwater that accumulates in open excavations and decontamination water will be treated as described in Section 8.3.2.3 and, consistent with Sections 761.50 and 761.79(b)(1)(ii), discharged to the sanitary sewer in conformance with a special discharge permit obtained from EBMUD (see Appendix G for permit). Prior to discharge, the treated water will be analyzed for PCB congeners by EPA Method 1668 and for other contaminants specified in the permit, and will only be discharged if the permit limit of 0.017 µg/L for the sum of the 59 PCB congeners listed in the permit can be met. LBNL’s contractor must obtain written permission from LBNL’s Environmental Services Group for treatment and discharge of decontamination water.

Samples of residues (sediments and sludge) and filters removed from components of the treatment system used to clean water accumulated in excavations will be collected and analyzed for contaminants of potential concern, including PCBs, to characterize these residues and filters for disposal in compliance with Section 761.79(g).

#### 5.1.1 PCB Remediation Waste

Per Section 761.3, waste containing total PCBs as a result of a spill, release, or other unauthorized disposal at the following concentrations is defined as PCB remediation waste:

- equal to or greater than 50 parts per million (ppm), regardless of the concentration of the original spill (for materials disposed of prior to April 18, 1978)

## 6 CLEANUP VERIFICATION SAMPLING

Verification sampling will be conducted after the slabs, utilities, and soils are removed from the Site per the excavation design described in Section 4.2. All verification soil samples will be collected, managed, and analyzed according to the procedures discussed in Section 9.1.

### 6.1 Sample Design Parameters

The verification sampling will be conducted in a manner designed to avoid decision errors resulting in residual PCBs remaining in the soil at the Site at concentrations that may impact human health or the environment. To avoid such errors, a statistical testing process will be used to develop the basis for the sampling grid used to verify that the soil cleanup goal (0.94 mg/kg) has been effectively achieved.

The statistical hypotheses are:

$H_0$ : the true mean total PCB concentration in residual soil is greater than 0.94 mg/kg

$H_a$ : the true mean total PCB concentration in residual soil is at or less than 0.94 mg/kg

Unless there is conclusive information from the verification sampling data to reject the null hypothesis (*i.e.*,  $H_0$ , the baseline condition) for the alternative hypothesis (*i.e.*,  $H_a$ , achievement of the cleanup goal), it will be assumed that the baseline condition is true.

The primary consequence of making a false rejection (type I) error by incorrectly rejecting a true null hypothesis is that soil containing PCBs at concentrations greater than the cleanup goal would be left on site, possibly endangering human health and the environment.

The primary consequence of making a false acceptance (type II) error by failing to reject a false null hypothesis is considerable expense to LBNL associated with remobilization to remove and dispose of soil containing PCBs at concentrations less than the cleanup goal.

Accordingly, due to the higher consequence of possibly endangering human health and the environment by potentially rejecting  $H_0$  when residual contamination is present at concentrations greater than the cleanup goal, a false rejection error tolerance is set to be no higher than 10 percent and a false acceptance decision error tolerance is set to be no higher than 20 percent. The extent of the grey region will be set at 0.2 mg/kg. In this case, acceptance of the grey region indicates that LBNL is willing to accept a higher probability of cleaning up soil between 0.74 and 0.94 mg/kg given that it will require fewer confirmation samples than if a narrower grey region (*e.g.*, 0.1 mg/kg) were selected.

### 6.2 Sampling Design

Verification sampling will be conducted using a square grid system. Composite or incremental sampling techniques will not be employed. A sampling grid will be applied to the areas of completed excavation – defined here as decision units – to verify that cleanup goals have been achieved. The grid spacing was developed using Visual Sample Plan (VSP) software (VSP Development Team, 2016) for two distinct excavation areas: 1) Buildings 52 and 52A and the electrical pad, and 2) Buildings 16 and 16A. Parameters input into VSP included the decision error parameters defined in Section 6.1 and estimates of site-specific standard deviation of PCB concentrations in soil underlying the planned area of excavation at each of the two areas (Appendix F, Figures A-4 and A-8). The estimated standard deviation was 0.55 mg/kg for Buildings 52 and 52A and the electrical pad, and 0.56 mg/kg for Buildings 16 and 16A.

Based on the input parameters, the minimum number of samples required to determine cleanup completion at Buildings 52 and 52A and the electrical pad is 56, and the minimum number of samples required to determine cleanup completion at Buildings 16 and 16A is 58. The geometries of the planned excavation footprints and the location of the random-start grid result in a grid spacing of 7.5 and 7.0 feet at each area, respectively. The spacing is estimated to yield at least the minimum numbers of samples calculated to be required for each area. The technical basis for this determination, along with example sampling grids, is provided in Appendix F.

In addition to the randomly determined sample locations at Buildings 52 and 52A, six samples will be collected from pre-determined locations in two areas in the vicinity of samples SB52-14-2 and SB52-14-43 (Appendix A, Figure A-2) where PCB concentrations exceed 50 mg/kg in deeper soil. In these areas, the excavations will be at least six feet deep. In the deep excavation near SB52-14-2, one sample will be collected from the bottom of the excavation, and one sample will be collected from each of the four sidewalls. The sidewall samples will be collected at a depth of 6 feet below the original grade, which is approximately the mid-depth of the highest zone of PCB concentrations in this area (4 to 8 feet). In the deep excavation near SB52-14-43, one sample will be collected from the bottom of the excavation. The results of the six samples collected at the predetermined locations will be combined with the results for the random grid samples for analysis to determine cleanup completion (see Section 6.3).

For Buildings 16 and 16A, in addition to the randomly determined sample locations, four samples will be collected on the south sidewall of the excavation at the south of the building (Appendix A, Figure A-8), beyond which excavation is not feasible due to presence of high-voltage utilities in the subsurface. These four samples will be used to characterize the soil remaining and will be excluded from the analysis of cleanup completion unless they contain total PCB concentrations of less than 0.94 mg/kg. The samples will be collected at 1.5 feet below ground surface to target the zone where the highest concentrations of PCBs were previously detected.

The sampling grids discussed above may be applied independently to multiple areas (decision units) at different stages to facilitate efficient sequencing of the demolition by allowing excavations and backfilling of excavated areas to be conducted in phases. If verification sampling follows such a sequenced approach to facilitate demolition, the sample spacings of 7.5 and 7.0 feet will remain fixed for each area (*i.e.*, the aggregate area of the decision units) and the quantity of samples will be at least 56 and 58 samples, respectively.

The grid will be laid out in the field, sample points physically marked, and sample locations and elevations surveyed as described in Section 7.10. The grids will be applied using a random start position established for each decision unit and oriented with one grid axis aligned with magnetic north.

### 6.3 Cleanup and Backfill Decision Parameters

Verification sample results will be analyzed spatially and used to calculate the 95 percent upper confidence limit on the mean (95 UCL) for direct comparison to the cleanup goal. It is expected that ten or more valid data points will be required to develop the 95 UCL, but specific statistical testing will need to be performed for each data set to confirm the number of samples required for the calculation. Single-point sample results within a decision unit (defined in Section 6.2) may exceed the cleanup goal, but additional cleanup would only be required if the 95 UCL concentration is determined to be greater than the cleanup goal or if the spatial analysis of the results shows that adjacent sample results exceed the cleanup goal. If adjacent samples exceed the cleanup goal, LBNL will prepare a map showing the spatial distribution of the verification sample results, and submit it to EPA, along with tabulated data, any

outputs of statistical analysis, and analytical reports. The need for additional excavation will be determined jointly by LBNL, DOE, and EPA. The decision, including the basis for the decision, will be documented in an email or letter prepared by EPA and provided to LBNL within 10 working days of the joint decision. All emails and letters documenting EPA's decisions will be included in the cleanup completion report (see Section 12).

Any decision unit for which LBNL confirms all sample results are at or less than the cleanup goal may be backfilled. Once EPA has concurred that the cleanup goal has been met, backfilling may begin. In the event of the need to backfill due to logistical constraints or safety concerns prior to receipt of EPA's approval, LBNL may backfill excavated areas with the understanding that additional cleanup of such areas may be required by EPA.

When the number of valid samples in a decision unit is less than is required to calculate the 95 UCL, all sample results must be at or less than the cleanup goal for the cleanup goal to be met for the decision unit.

If verification sampling results for a decision unit exceed the 95UCL or show that PCBs remain at concentrations exceeding the cleanup goal in specific areas, additional focused excavation will be conducted in areas with distinct concentrations greater than the cleanup goal. After completion of the focused excavation, verification sampling will be conducted in the newly excavated area using a local area grid with a randomly selected start. Cleanup verification under these circumstances will be based on a re-evaluation of the combined data set consisting of 1) the prior data for the decision unit – excluding those data from the affected area(s), and 2) the results of samples collected from the the newly excavated area(s).

If additional excavation is not possible, the excavation boundaries and areas of known residual PCB concentrations greater than the cleanup goal will be surveyed by a California licensed land surveyor using the UC grid system prior to backfilling. The location(s) of known residual contamination, if any, will be documented in the cleanup completion report (see Section 12) and may be subject to land use controls as described in Section 13.

## **14 RECORDKEEPING**

LBNL will retain the cleanup completion report, along with records of sampling and analysis, decontamination, cleanup, and disposal of PCBs as described below. Copies of records, if requested, will be made available to EPA. Records will be maintained in accordance with LBNL's records retention policy and project-specific records management requirements. In addition, all records will be retained in accordance with Part 761 as discussed below.

### **14.1 Sampling and Analysis Records**

LBNL will retain records of sampling and analysis including at a minimum: analytical laboratory reports, data validation reports, and field sampling records (including COC forms, daily field reports, and field sampling forms) for a period of at least five years per Section 761.61(a)(9).

### **14.2 Decontamination Records**

If any equipment or items that contained or were exposed to greater than 50 mg/kg or 10 µg/100 cm<sup>2</sup> (for non-porous surfaces) of PCBs were decontaminated and then reused or recycled, LBNL would retain records of the decontamination for a period of at least three years per Section 761.79(f)(2). Decontamination records will be included in the cleanup completion report (see Section 12).

### **14.3 Cleanup Records**

LBNL will retain the cleanup completion report (see Section 12) and any other records of cleanup activities, including documentation with maps, tables, and text of the locations, depths, and volumes where soil was excavated, for a period of at least five years per Section 761.61(a)(9).

### **14.4 Waste Management, Transportation, and Disposal Records**

LBNL will retain waste profiles, manifests, bills of lading, and certificates of disposal per LBNL's records retention policy.

A copy of each signed manifest accompanying PCB waste for off-site disposal will be maintained until LBNL receives a signed copy from the designated disposal facility. LBNL's Waste Management Group will retain the signed copy for at least three years from the date the PCB waste was accepted by the initial transporter. After three years the manifests will be transferred to the LBNL Records and Archive Office.

Certificates of disposal will be retained for at least three years from the date the PCB waste was accepted by the initial transporter.

## 15 SCHEDULE

EPA has agreed to review the application (addressing PCB cleanup of Buildings 52 and 52A and the electrical pad, submitted on February 22, 2016) within 60 days. Presuming it is approved, the approval date is expected to be April 22, 2016.

EPA has indicated that review of the amendment to the application (addressing cleanup of Buildings 16 and 16A, submitted on March 25, 2016) may be completed along with the review of the initial submittal. If EPA's approval of the amendment is received on April 22, 2016, cleanup at Buildings 16 and 16A will likely follow cleanup of Buildings 52 and 52A and the electrical pad, although the sequence may be adjusted, if required. A detailed schedule is being updated and will be provided to EPA at the monthly progress meetings.

PCB cleanup is anticipated to be completed in 2016 based on the presumption that verification sampling will indicate that the cleanup goal has been achieved at each area cleaned up. If additional soil must be excavated, the schedule will be extended as necessary to accommodate additional cleanup and post-cleanup verification sampling.

## **Appendix A. Figures**

Figure A-1. Buildings 52, 52A, and the Electrical Pad–Total PCB Concentrations in Concrete and Sediment

Figure A-2. Buildings 52, 52A, and the Electrical Pad–Total PCB Concentrations in Soil

Figure A-3. Buildings 52, 52A and the Electrical Pad–Proposed Concrete Disposition Plan

Figure A-4. Buildings 52, 52A and the Electrical Pad–Proposed Excavation Plan

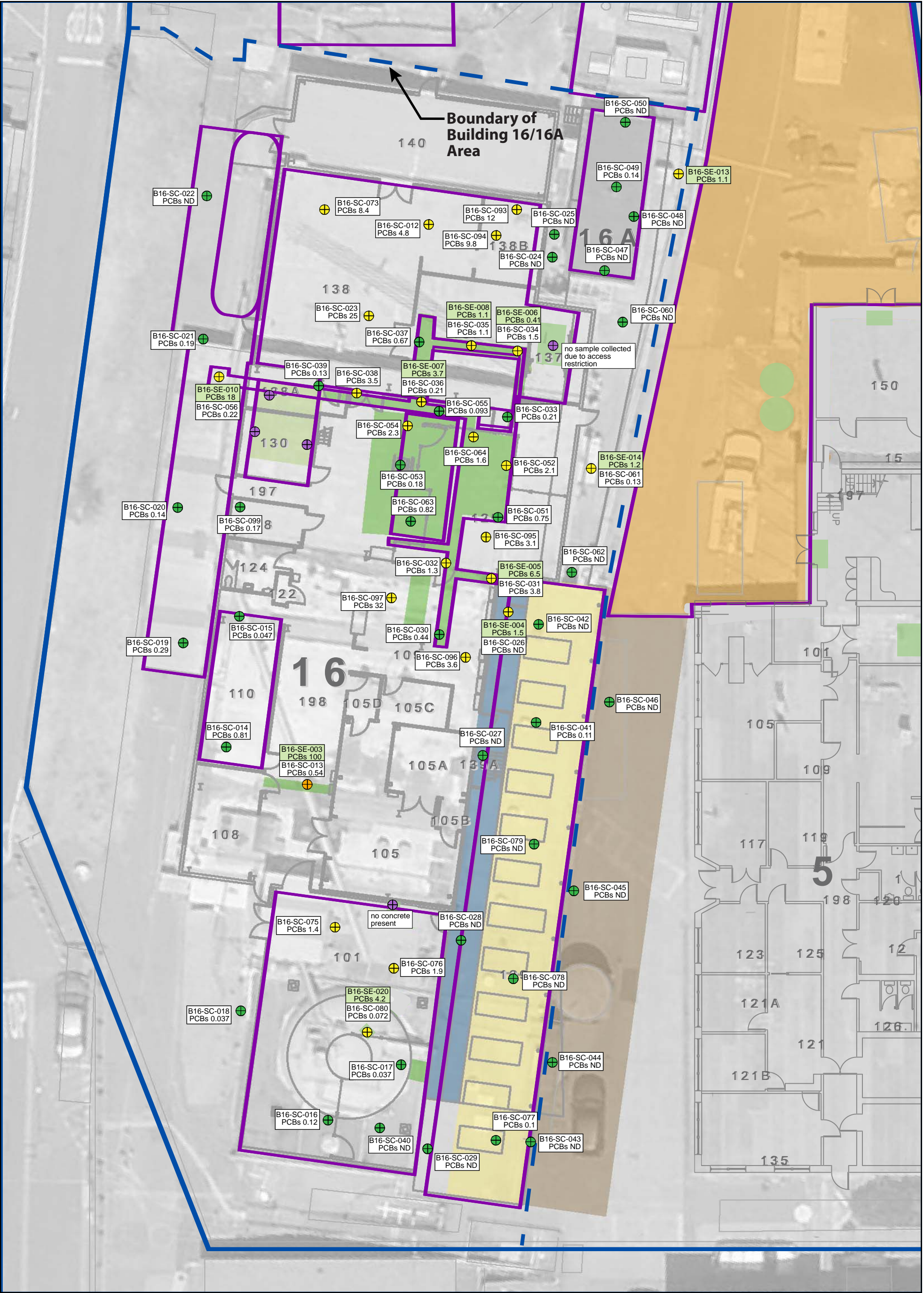
Figure A-5. Buildings 16, 16A–Total PCB Concentrations in Concrete and Sediment

Figure A-6. Buildings 16, 16A–Total PCB Concentrations in Soil

Figure A-7. Buildings 16, 16A–Proposed Concrete Disposition Plan

Figure A-8. Buildings 16, 16A–Proposed Excavation Plan





EXPLANATION

- B16-SC-058  
PCBs 1.6

⊕

B16-SE-025  
PCBs 16

⊕

ND

⊕

NOTE:

1. Aerial Imagery © 2014 Pictometry
- Concrete sample result showing sample number and total PCB concentration (mg/kg)

Sediment sample result showing sample number and total PCB concentration (mg/kg)

Sample result indicating all PCB areocloros not detected

Planned sample location
- Dungeon

Pit/Trench/Vault

Historical Pit

Perkins East Sampling

Building 5 Radiological Waste Processing Yard

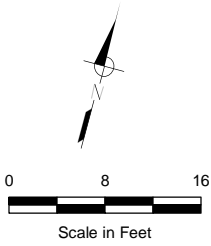
Perkins Pad
- Total PCB Concentration Color Coding

≤ 0.94 mg/kg

> 0.94 mg/kg

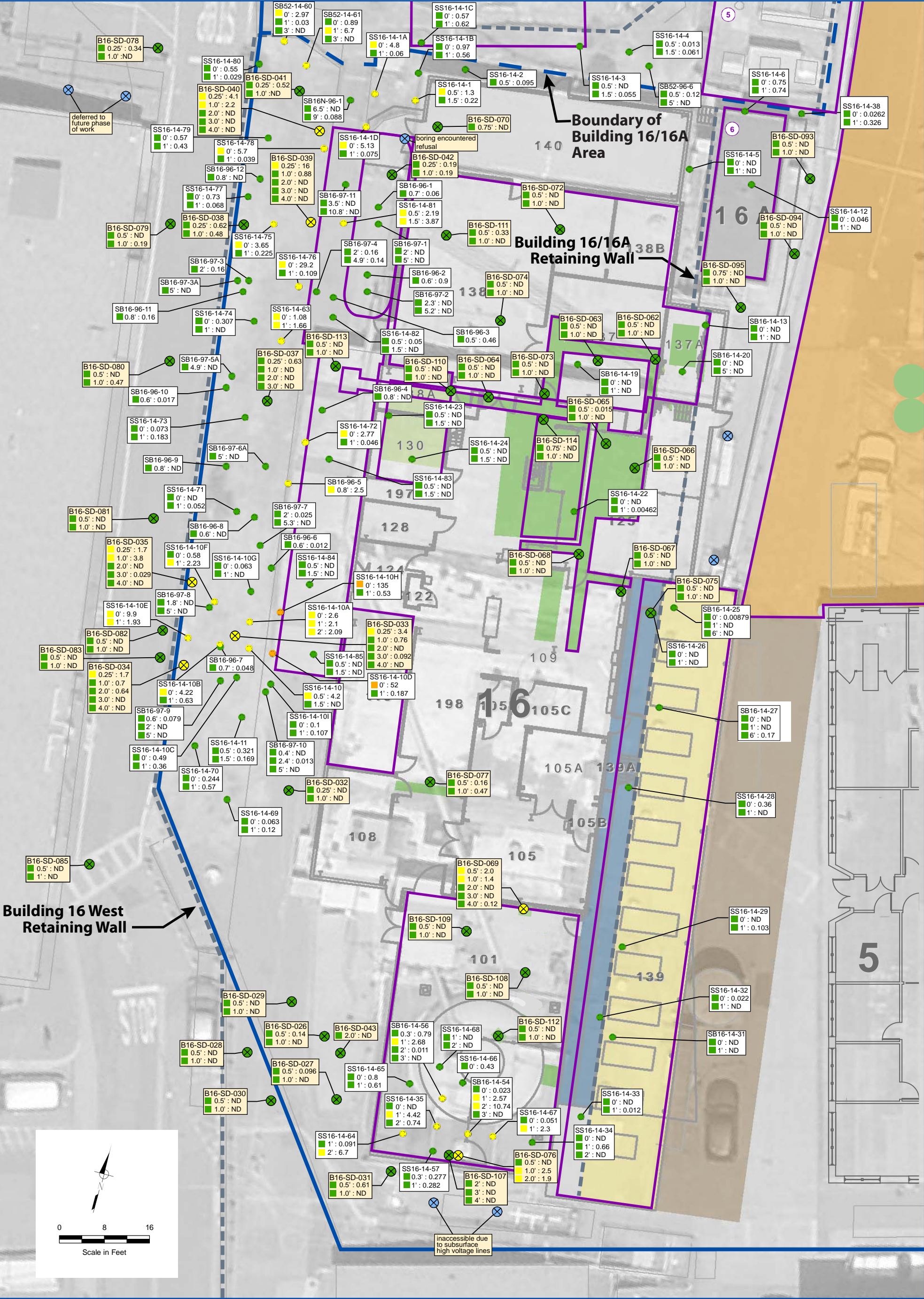
> 50 mg/kg
- Project Area

Area of PCB Use



**Figure A-5**  
**Buildings 16 and 16A**  
**Concrete and Sediment**  
**Sample Results**  
Dynamic Management Solutions, LLC  
LBNL Old Town





EXPLANATION

- Project Area
- Area of PCB Use
- Dungeon
- Pit/Trench/Vault
- Historical Pit

- Perkins East Sampling
- Building 5 Radiological Waste Processing Yard
- Perkins Pad

- Total PCB Concentration Color Coding**
- ≤ 0.94 mg/kg
  - > 0.94 mg/kg
  - > 50 mg/kg

- SS52-14-11  
1.0' : 0.68
- B16-SD-025  
1.0' : 16

Pre-2015 sample result showing sample number, depth of sample (feet), and total PCB concentration (mg/kg).

2015-2016 sample result showing sample number, depth of sample (feet), and total PCB concentration (mg/kg).

- ND  
Sample result indicating all PCB areocloris not detected
- Planned sample location

**Figure A-6**  
**Buildings 16 and 16A**  
**Total PCB Concentrations in Soil**  
**Old Town Demolition Project**  
**Phase I**

Dynamic Management Solutions, LLC  
LBNL Old Town

NOTE:  
Aerial Imagery © 2014 Pictometry



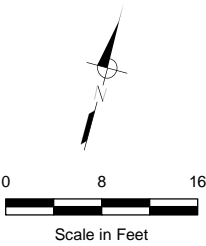


**EXPLANATION**

- Project Area
- Pit/Trench/Vault
- Building 5 Radiological Waste Processing Yard

- Concrete slab to be disposed of as PCB remediation waste < 50 mg/kg total PCBs
- Concrete slab potentially to be disposed of as low level radioactive waste (pending analytical results)
- All concrete other than indicated above may be disposed of at a Class III disposal facility.

NOTE:  
1. Aerial Imagery © 2014 Pictometry



**Figure A-7**  
**Proposed Concrete Disposition Plan**  
**Buildings 16 and 16A**  
**Old Town Demolition Project**  
**Phase I**





EXPLANATION

- Project Area
- Area of PCB Use
- Pit/Trench/Vault
- Building 5 Radiological Waste Processing Yard
- Storm sewers and catchbasins showing direction of flow. Dashed segments to be demolished

Maximum Total PCB Concentration Detected in Soil Boring

- ≤ 0.94 mg/kg
- > 0.94 mg/kg
- > 50 mg/kg

- Pre-2015 soil boring location.
- 2015-2016 soil boring location.
- Depth in feet of shallowest sample in boring containing no samples with total PCB concentrations exceeding 0.94 mg/kg.
- Depth in feet of shallowest "clean" (≤ 0.94 mg/kg total PCBs) sample beneath PCB-contaminated soil. Note that collocated borings are treated as a single boring.
- Maximum depth of PCBs > 0.94 mg/kg not determined because all samples in boring exceeded 0.94 mg/kg. Value shows depth in feet of deepest sample in boring.

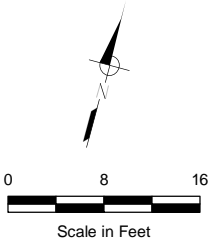


Figure A-8  
Proposed Excavation Plan  
Buildings 16 and 16A  
Old Town Demolition Project  
Phase I

Dynamic Management Solutions, LLC  
LBNS Old Town



## **Appendix B. Summary Tables of PCB Analytical Results**

Summary of PCB Concentration Ranges in Above Slab Building Materials, Old Town Demolition Project

Table B-1	Summary of PCB Concentrations in Concrete and Sediment at Building 52, 52A and the Electrical Pad
Table B-2	Soil Sampling Results from Old Town Demolition Project, Buildings 52, 52A, Electrical Pad Area–Polychlorinated Biphenyls
Table B-3	Concrete Sampling Results from Old Town Demolition Project Buildings 16/16A Polychlorinated Biphenyls
Table B-4	Sediment Sampling Results from Old Town Demolition Project Buildings 16/16A Polychlorinated Biphenyls
Table B-5	Soil Sampling Results from Old Town Demolition Project Buildings 16/16A Polychlorinated Biphenyls



**Table B-3**  
**Concrete Sampling Results from Old Town Demolition Project–Buildings 16 and 16A**  
**Polychlorinated Biphenyls**  
(concentrations in mg/kg)

Screening Level*			PCBs-8082**					
			Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1268	Total PCBs
								0.94
Location	Lab	Date						
B16-SC-012	CT	12/3/15	< 0.068	< 0.068	< 0.068	3.2	1.6	4.8
B16-SC-013	CT	12/3/15	< 0.07	< 0.07	< 0.07	0.36	0.18	0.54
B16-SC-014	CT	12/3/15	< 0.071	< 0.071	< 0.071	0.81	< 0.071	0.81
B16-SC-015	CT	12/3/15	< 0.01	< 0.01	< 0.01	0.047	< 0.01	0.047
B16-SC-016	CT	12/3/15	< 0.01	< 0.01	< 0.01	0.07	0.052	0.12
B16-SC-017	CT	12/3/15	< 0.01	< 0.01	< 0.01	0.037	< 0.01	0.037
B16-SC-018	CT	12/3/15	< 0.01	< 0.01	< 0.01	0.024	0.013	0.037
B16-SC-019 (D)	CT	12/4/15	< 0.069	< 0.069	0.11	0.18	< 0.069	0.29
	CT	12/4/15	< 0.067	< 0.067	0.1	0.14	< 0.067	0.25
B16-SC-020	CT	12/4/15	< 0.091	< 0.091	< 0.091	0.14	< 0.091	0.14
B16-SC-021	CT	12/4/15	< 0.07	< 0.07	0.08	0.11	< 0.07	0.19
B16-SC-022	CT	12/4/15	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	ND
B16-SC-023	CT	12/4/15	< 0.69	< 0.69	2.0	18	5.7	25
B16-SC-024	CT	12/4/15	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	ND
B16-SC-025	CT	12/4/15	< 0.57	< 0.57	< 0.57	< 0.57	< 0.57	ND
B16-SC-026	CT	12/4/15	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	ND
B16-SC-027	CT	12/4/15	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	ND
B16-SC-028	CT	12/4/15	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	ND
B16-SC-029	CT	12/4/15	< 0.86	< 0.86	< 0.86	< 0.86	< 0.86	ND
B16-SC-030	CT	12/11/15	< 0.074	< 0.074	0.26	0.18	< 0.074	0.44
B16-SC-031	CT	12/11/15	< 0.1	< 0.1	0.65	1.5	1.6	3.8
B16-SC-032	CT	12/11/15	< 0.071	< 0.071	0.53	0.56	0.16	1.3
B16-SC-033	CT	12/11/15	< 0.011	< 0.011	0.11	0.095	< 0.011	0.21
B16-SC-034 (D)	CT	12/11/15	< 0.069	< 0.069	1.1	0.4	< 0.069	1.5
	CT	12/11/15	< 0.071	< 0.071	1.1	0.37	< 0.071	1.5
B16-SC-035	CT	12/11/15	< 0.071	< 0.071	0.62	0.5	< 0.071	1.1
B16-SC-036	CT	12/11/15	< 0.078	< 0.078	0.11	0.097	< 0.078	0.21
B16-SC-037	CT	12/11/15	< 0.072	< 0.072	0.41	0.26	< 0.072	0.67
B16-SC-038	CT	12/11/15	< 0.078	< 0.078	2.3	1.2	< 0.078	3.5
B16-SC-039	CT	12/11/15	< 0.072	< 0.072	< 0.072	0.13	< 0.072	0.13
B16-SC-040	CT	12/14/15	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	ND
B16-SC-041	CT	12/14/15	< 0.01	< 0.01	0.059	0.05	< 0.01	0.11
B16-SC-042 (D)	CT	12/14/15	< 0.072	< 0.072	< 0.072	< 0.072	< 0.072	ND
	CT	12/14/15	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	ND
B16-SC-043	CT	12/14/15	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	ND
B16-SC-044	CT	12/14/15	< 0.068	< 0.068	< 0.068	< 0.068	< 0.068	ND
B16-SC-045	CT	12/14/15	< 0.069	< 0.069	< 0.069	< 0.069	< 0.069	ND
B16-SC-046	CT	12/14/15	< 0.071	< 0.071	< 0.071	< 0.071	< 0.071	ND
B16-SC-047	CT	12/14/15	< 0.069	< 0.069	< 0.069	< 0.069	< 0.069	ND
B16A-SC-048	CT	12/14/15	< 0.069	< 0.069	< 0.069	< 0.069	< 0.069	ND
B16A-SC-049	CT	12/14/15	< 0.0098	< 0.0098	0.083	0.06	< 0.0098	0.14
B16A-SC-050	CT	12/14/15	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	ND
B16-SC-051	CT	12/15/15	< 0.069	< 0.069	0.26	0.28	0.21	0.75

**Table B-3 (Cont'd)**  
**Concrete Sampling Results from Old Town Demolition Project-Building 16/16A Area**  
**Polychlorinated Biphenyls**  
(concentrations in mg/kg)

Location	Lab	Date	PCBs-8082**					
			Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1268	Total PCBs
			Screening Level*					
								0.94
B16-SC-052	CT	12/15/15	< 0.0098	< 0.0098	1.7	0.34	< 0.0098	<b>2.1</b>
B16-SC-053	CT	12/15/15	< 0.07	< 0.07	< 0.07	0.18	< 0.07	0.18
B16-SC-054	CT	12/15/15	< 0.067	< 0.067	0.77	1.1	0.37	<b>2.3</b>
B16-SC-055	CT	12/15/15	< 0.07	< 0.07	< 0.07	0.093	< 0.07	0.093
B16-SC-056	CT	12/16/15	< 0.071	< 0.071	0.096	0.12	< 0.071	0.22
B16-SC-060	CT	12/16/15	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	ND
B16-SC-061 (D)	CT	12/16/15	< 0.069	< 0.069	< 0.069	0.13	< 0.069	0.13
	CT	12/16/15	< 0.069	< 0.069	< 0.069	0.12	< 0.069	0.12
B16-SC-062	CT	12/16/15	< 0.068	< 0.068	< 0.068	< 0.068	< 0.068	ND
B16-SC-063 (D)	CT	12/17/15	< 0.068	< 0.068	0.45	0.23	0.14	0.82
	CT	12/17/15	< 0.07	< 0.07	< 0.07	0.23	0.078	0.31
B16-SC-064	CT	12/17/15	< 0.067	< 0.067	1.2	0.41	< 0.067	<b>1.6</b>
B16-SC-073 (D)	CT	1/7/16	< 0.068	< 0.068	< 0.068	5.2	3.3	<b>8.4</b>
	CT	1/7/16	< 0.068	< 0.068	< 0.068	5.3	2.7	<b>8.0</b>
B16-SC-074	CT	1/7/16	< 0.069	< 0.069	0.97	1.6	< 0.069	<b>2.6</b>
B16-SC-075	CT	1/7/16	< 0.01	< 0.01	1.1	0.29	< 0.01	<b>1.4</b>
B16-SC-076	CT	1/7/16	< 0.069	< 0.069	1.4	0.46	< 0.069	<b>1.9</b>
B16-SC-077 (D)	CT	1/12/16	< 0.071	< 0.071	< 0.071	0.1	< 0.071	0.1
	CT	1/12/16	< 0.069	< 0.069	< 0.069	0.081	< 0.069	0.081
B16-SC-078	CT	1/12/16	< 0.071	< 0.071	< 0.071	< 0.071	< 0.071	ND
B16-SC-079	CT	1/12/16	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	ND
B16-SC-080	CT	1/12/16	0.026	< 0.021	< 0.021	0.046	< 0.021	0.072
B16-SC-093	CT	1/28/16	< 0.14	< 0.14	< 0.14	9.0	3.3	<b>12</b>
B16-SC-094	CT	1/28/16	< 0.14	< 0.14	< 0.14	7.2	2.6	<b>9.8</b>
B16-SC-095 (D)	CT	1/28/16	< 0.07	< 0.07	0.88	1.4	0.45	<b>2.7</b>
	CT	1/28/16	< 0.071	< 0.071	0.84	1.4	0.9	<b>3.1</b>
B16-SC-096	CT	1/28/16	< 0.069	0.9	0.82	1.2	0.65	<b>3.6</b>
B16-SC-097	CT	1/28/16	< 0.36	< 0.36	< 0.36	24	7.9	<b>32</b>
B16-SC-098	CT	1/28/16	< 0.07	< 0.07	0.57	1.5	0.5	<b>2.6</b>
B16-SC-099	CT	1/28/16	< 0.072	< 0.072	0.089	0.084	< 0.072	0.17

\* The screening level is the composite worker (industrial) regional screening level of 0.94 mg/kg for high risk Aroclors published by the EPA Region 9 in the "Regional Screening Levels for Chemical Contaminants at Superfund Sites," <http://www.epa.gov/region9/superfund/prgl/>, accessed on February 12, 2016.

\*\* Analytes included Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, and 1268.

Boldface type indicates concentration above screening level

CT: Analysis by Curtis & Tompkins Ltd

< concentration less than limit of quantitation (LOQ)

ND: No PCB Aroclors detected

**Table B-4**  
**Sediment Sampling Results from Old Town Demolition Project—Buildings 16 and 16A**  
**Polychlorinated Biphenyls**  
(concentrations in mg/kg)

Screening Level*			PCBs-8082**					
			Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1268	Total PCBs
								0.94
Location	Lab	Date						
B16-SE-003	CT	12/3/15	< 1.3	< 1.3	5.3	71	26	<b>100</b>
B16-SE-004	CT	12/4/15	< 0.43	< 0.43	0.94	0.58	< 0.43	<b>1.5</b>
B16-SE-005	CT	12/10/15	< 0.15	< 0.15	4.0	2.5	< 0.15	<b>6.5</b>
B16-SE-006	CT	12/11/15	< 0.11	< 0.11	0.21	0.2	< 0.11	0.41
B16-SE-007	CT	12/11/15	< 0.11	< 0.11	2.1	1.6	< 0.11	<b>3.7</b>
B16-SE-008	CT	12/11/15	< 0.016	< 0.016	0.49	0.43	0.13	<b>1.1</b>
B16-SE-009	CT	12/11/15	< 0.12	< 0.12	3.0	2.4	0.66	<b>6.1</b>
B16-SE-010	CT	12/16/15	< 0.95	< 0.95	12	6.1	< 0.95	<b>18</b>
B16-SE-013	CT	12/16/15	< 0.089	< 0.089	0.6	0.54	< 0.089	<b>1.1</b>
B16-SE-014	CT	12/16/15	< 0.088	< 0.088	0.59	0.46	0.13	<b>1.2</b>
B16-SE-018	CT	1/11/16	< 1.6	< 1.6	3.2	9.7	< 1.6	<b>13</b>
B16-SE-019	CT	1/11/16	< 0.97	< 0.97	12	33	< 0.97	<b>46</b>
B16-SE-020	CT	1/12/16	2.6	< 0.1	0.91	0.53	0.021	<b>4.2</b>

\* The screening level is the composite worker (industrial) regional screening level of 0.94 mg/kg for high risk Aroclors published by the EPA Region 9 in the "Regional Screening Levels for Chemical Contaminants at Superfund Sites," <http://www.epa.gov/region9/superfund/prg/>, accessed on February 12, 2016.

\*\* Analytes included Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, and 1268.

Boldface type indicates concentration above screening level

CT: Analysis by Curtis & Tompkins Ltd

< concentration less than limit of quantitation (LOQ)

ND: No PCB Aroclors detected

**Table B-5**  
**Soil Sampling Results from Old Town Demolition Project—Buildings 16 and 16A**  
**Polychlorinated Biphenyls**  
(concentrations in mg/kg)

Location	Sample ID	Depth (ft)	Lab	Date	PCBs-8082**					Total PCBs
					Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1268	
					Screening Level*					
										0.94
SB16-96-1	BS-SB16-96-1-0.7	0.7	BC	8/15/96	< 0.01	< 0.01	0.06	< 0.01		0.06
SB16-96-2	BS-SB16-96-2-0.6	0.6	BC	8/15/96	< 0.1	< 0.1	0.9	< 0.1		0.9
SB16-96-3	BS-SB16-96-3-0.5	0.5	BC	8/15/96	< 0.1	< 0.1	0.46	< 0.1		0.46
SB16-96-4	BS-SB16-96-4-0.8	0.8	BC	8/15/96	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16-96-5	BS-SB16-96-5-0.8	0.8	BC	8/15/96	< 0.2	< 0.2	2.5	< 0.2		2.5
SB16-96-6	BS-SB16-96-6-0.6	0.6	BC	8/16/96	< 0.01	< 0.01	0.012	< 0.01		0.012
SB16-96-7	BS-SB16-96-7-0.7	0.7	BC	8/16/96	< 0.01	< 0.01	0.048	< 0.01		0.048
SB16-96-8	BS-SB16-96-8-0.6	0.6	BC	8/16/96	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16-96-9	BS-SB16-96-9-0.8	0.8	BC	8/16/96	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16-96-10	BS-SB16-96-10-0.6	0.6	BC	8/16/96	< 0.01	< 0.01	0.017	< 0.01		0.017
SB16-96-11	BS-SB16-96-11-0.8	0.8	BC	8/16/96	< 0.05	< 0.05	0.16	< 0.05		0.16
SB16-96-12	BS-SB16-96-12-0.8	0.8	BC	8/16/96	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16-97-1	BS-SB16-97-1-2	2.0	BC	3/20/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
	BS-SB16-97-1-5	5.0	BC	3/21/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16-97-2	BS-SB16-97-2-2.3	2.3	BC	3/20/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
	BS-SB16-97-2-5.2	5.2	BC	3/21/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16-97-3	BS-SB16-97-3-2	2.0	BC	3/20/97	< 0.02	< 0.02	0.16	< 0.02		0.16
SB16-97-3A	BS-SB16-97-3A-5	5.0	BC	3/27/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16-97-4	BS-SB16-97-4-2	2.0	BC	3/20/97	< 0.02	< 0.02	0.16	< 0.02		0.16
	BS-SB16-97-4-4.9	4.9	BC	3/27/97	< 0.02	< 0.02	0.14	< 0.02		0.14
SB16-97-5A	BS-SB16-97-5A-4.9	4.9	BC	3/27/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16-97-6A	BS-SB16-97-6A-5	5.0	BC	3/27/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16-97-7	BS-SB16-97-7-2	2.0	BC	3/20/97	< 0.01	< 0.01	0.025	< 0.01		0.025
	BS-SB16-97-7-5.3	5.3	BC	3/21/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16-97-8	BS-SB16-97-8-1.8	1.8	BC	3/20/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
	BS-SB16-97-8-5	5.0	BC	3/21/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16-97-9	BS-SB16-97-9-0.6	0.6	BC	3/20/97	< 0.01	< 0.01	0.079	< 0.01		0.079
	BS-SB16-97-9-2	2.0	BC	3/20/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
	BS-SB16-97-9-5	3.0	BC	3/21/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16-97-10	BS-SB16-97-10-0.4	0.4	BC	3/20/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
	BS-SB16-97-10-2.4	2.4	BC	3/20/97	< 0.01	< 0.01	0.013	< 0.01		0.013
	BS-SB16-97-10-5	5.0	BC	3/21/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16-97-11	BS-SB16-97-11-3.5	3.5	BC	11/10/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
	BS-SB16-97-11-10.8	10.8	BC	11/10/97	< 0.01	< 0.01	< 0.01	< 0.01		ND
SB16N-96-1	BS-SB16N-96-1-6.5	6.5	BC	8/27/96	< 0.01	< 0.01	< 0.01	< 0.01		ND
	BS-SB16N-96-1-9	9.0	BC	8/27/96	< 0.01	< 0.01	0.088	< 0.01		0.088
SS16-14-1	SS16-14-1-0.5'	0.5	CT	5/30/14	< 0.034	< 0.034	1.3	< 0.034	< 0.034	1.3
	SS16-14-1-1.5'	1.5	CT	5/30/14	< 0.0098	< 0.0098	0.22	< 0.0098	< 0.0098	0.22
SS16-14-1A	SS16-14-1A-3"	0.0	CT	6/25/14	< 0.067	< 0.067	3.7	1.1	< 0.067	4.8
	SS16-14-1A-1'	1.0	CT	6/25/14	< 0.0099	< 0.0099	0.047	0.013	< 0.0099	0.16
SS16-14-1B	SS16-14-1B-3"	0.0	CT	6/25/14	< 0.034	< 0.034	0.72	0.25	< 0.034	0.97
	SS16-14-1B-1'	1.0	CT	6/25/14	< 0.033	< 0.033	0.33	0.23	< 0.033	0.56
SS16-14-1C	SS16-14-1C-3"	0.0	CT	6/25/14	< 0.034	< 0.034	0.32	0.25	< 0.034	0.57
	SS16-14-1C-1'	1.0	CT	6/25/14	< 0.034	< 0.034	0.33	0.29	< 0.034	0.62
SS16-14-1D	SS16-14-1D-3"	0.0	CT	6/25/14	< 0.066	< 0.066	4.4	0.73	< 0.066	5.13
	SS16-14-1D-1'	1.0	CT	6/25/14	< 0.0097	< 0.0097	0.058	0.017	< 0.0097	0.075
SS16-14-2	SS16-14-2-0.5'	0.5	CT	5/30/14	< 0.0096	< 0.0096	0.095	< 0.0096	< 0.0096	0.095

**Table B-5 (Cont'd)**  
**Soil Sampling Results from Old Town Demolition Project-Building 16/16A Area**  
**Polychlorinated Biphenyls**  
(concentrations in mg/kg)

Location	Sample ID	Depth (ft)	Lab	Date	PCBs-8082**					Total PCBs
					Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1268	
					Screening Level*					
										0.94
SS16-14-3	SS16-14-3-0.5'	0.5	CT	5/30/14	< 0.0099	< 0.0099	< 0.0099	< 0.0099	< 0.0099	ND
	SS16-14-3-1.5'	1.5	CT	5/30/14	< 0.0099	< 0.0099	0.055	< 0.0099	< 0.0099	0.055
SS16-14-4	SS16-14-4-0.5'	0.5	CT	5/30/14	< 0.0097	< 0.0097	0.013	< 0.0097	< 0.0097	0.013
	SS16-14-4-1.5'	1.5	CT	5/30/14	< 0.0098	< 0.0098	0.061	< 0.0098	< 0.0098	0.061
SS16-14-5	SS16-14-5-0'	0.0	CT	6/2/14	< 0.0097	< 0.0097	< 0.0097	< 0.0097	< 0.0097	ND
	SS16-14-5-1'	1.0	CT	6/2/14	< 0.0097	< 0.0097	< 0.0097	< 0.0097	< 0.0097	ND
SS16-14-6	SS16-14-6-0'	0.0	CT	7/21/14	< 0.0099	< 0.0099	0.48	0.27	< 0.0099	0.75
	SS16-14-6-1'	1.0	CT	7/21/14	< 0.0099	< 0.0099	0.45	0.29	< 0.0099	0.74
SS16-14-10	SS16-14-10-0.5'	0.5	CT	6/2/14	< 0.067	< 0.067	4.2	< 0.067	< 0.067	<b>4.2</b>
	SS16-14-10-1.5'	1.5	CT	6/2/14	< 0.0095	< 0.0095	< 0.0095	< 0.0095	< 0.0095	ND
SS16-14-10A	SS16-14-10A-3"	0.0	CT	6/25/14	< 0.034	< 0.034	2.3	0.3	< 0.034	<b>2.6</b>
	SS16-14-10A-1'	1.0	CT	6/25/14	< 0.034	< 0.034	1.8	0.3	< 0.034	<b>2.1</b>
	SS16-14-10A-2'	2.0	CT	7/21/14	< 0.033	< 0.033	1.9	0.19	< 0.033	<b>2.09</b>
SS16-14-10B	SS16-14-10B-3"	0.0	CT	6/25/14	< 0.065	< 0.065	3.4	0.82	< 0.065	<b>4.22</b>
	SS16-14-10B-1'	1.0	CT	6/25/14	< 0.0096	< 0.0096	0.46	0.17	< 0.0096	0.63
SS16-14-10C	SS16-14-10C-3"	0.0	CT	6/25/14	< 0.0098	< 0.0098	0.37	0.12	< 0.0098	0.49
	SS16-14-10C-1'	1.0	CT	6/25/14	< 0.033	< 0.033	0.15	0.21	< 0.033	0.36
SS16-14-10D	SS16-14-10D-3"	0.0	CT	6/25/14	< 0.68	< 0.68	36	16	< 0.68	<b>52</b>
	SS16-14-10D-1'	1.0	CT	6/25/14	< 0.034	< 0.034	0.15	0.037	< 0.034	0.187
SS16-14-10E	SS16-14-10E-0'	0.0	CT	7/18/14	< 1.3	< 1.3	9.9	< 1.3	< 1.3	<b>9.9</b>
	SS16-14-10E-1'	1.0	CT	7/18/14	< 0.033	< 0.033	1.6	0.33	< 0.033	<b>1.93</b>
SS16-14-10F	SS16-14-10F-0'	0.0	CT	7/18/14	< 0.0098	< 0.0098	0.58	< 0.0098	< 0.0098	0.58
	SS16-14-10F-1'	1.0	CT	7/18/14	< 0.034	< 0.034	1.9	0.33	< 0.034	<b>2.23</b>
SS16-14-10G	SS16-14-10G-0'	0.0	CT	7/18/14	< 0.0099	< 0.0099	0.063	< 0.0099	< 0.0099	0.063
	SS16-14-10G-1'	1.0	CT	7/18/14	< 0.034	< 0.034	< 0.034	< 0.034	< 0.034	ND
SS16-14-10H	SS16-14-10H-0'	0.0	CT	7/18/14	< 1.4	< 1.4	120	15	< 1.4	<b>135</b>
	SS16-14-10H-1'	1.0	CT	7/18/14	< 0.0095	< 0.0095	0.53	< 0.0095	< 0.0095	0.53
SS16-14-10I	SS16-14-10I-0'	0.0	CT	7/18/14	< 0.0098	< 0.0098	0.06	0.04	< 0.0098	0.1
	SS16-14-10I-1'	1.0	CT	7/18/14	< 0.0094	< 0.0094	0.081	0.026	< 0.0094	0.107
SS16-14-11	SS16-14-11-0.5'	0.5	CT	6/2/14	< 0.0097	< 0.0097	0.24	0.081	< 0.0097	0.321
	SS16-14-11-1.5'	1.5	CT	6/2/14	< 0.0096	< 0.0096	0.11	0.059	< 0.0096	0.169
SS16-14-12	SS16-14-12-0'	0.0	CT	6/2/14	< 0.0097	< 0.0097	0.046	< 0.0097	< 0.0097	0.046
	SS16-14-12-1'	1.0	CT	6/2/14	< 0.0098	< 0.0098	< 0.0098	< 0.0098	< 0.0098	ND
SB16-14-13	SS16-14-13-0'	0.0	GEL	6/2/14	< 0.00434	< 0.00434	< 0.00144	< 0.00144		ND
	SS16-14-13-1'	1.0	GEL	6/2/14	< 0.00414	< 0.00414	< 0.00414	< 0.00414		ND
SB16-14-19	SB16-14-19-0'	0.0	CT	6/2/14	< 0.0099	< 0.0099	< 0.0099	0.0024 <sup>J</sup>	< 0.0099	0.0024 <sup>J</sup>
	SB16-14-19-1'	1.0	CT	6/2/14	< 0.0098	< 0.0098	< 0.0098	0.0024 <sup>J</sup>	< 0.0098	0.0024 <sup>J</sup>
SB16-14-20	SB16-14-20-0'	0.0	GEL	5/30/14	< 0.00415	< 0.00415	< 0.00415	< 0.00415		ND
	SB16-14-20-5'	5.0	GEL	5/30/14	< 0.0043	< 0.0043	< 0.0043	< 0.0043		ND
SS16-14-22	SS16-14-22-0'	0.0	GEL	6/2/14	< 0.00372	< 0.00372	< 0.00372	< 0.00372		ND
	SS16-14-22-1'	1.0	GEL	6/2/14	< 0.00385	< 0.00385	0.00462	< 0.00385		0.00462
SS16-14-23	SS16-14-23-0.5'	0.5	CT	6/2/14	< 0.0096	< 0.0096	< 0.0096	< 0.0096	< 0.0096	ND
	SS16-14-23-1.5'	1.5	CT	6/2/14	< 0.0098	< 0.0098	< 0.0098	< 0.0098	< 0.0098	ND
SS16-14-24	SS16-14-24-0.5'	0.5	CT	6/2/14	< 0.0098	< 0.0098	< 0.0098	< 0.0098	< 0.0098	ND
	SS16-14-24-1.5'	1.5	CT	6/2/14	< 0.0098	< 0.0098	< 0.0098	< 0.0098	< 0.0098	ND
SB16-14-25	SB16-14-25-0'	0.0	GEL	5/30/14	< 0.00414	< 0.00414	0.00439	0.0044		0.00879
	SB16-14-25-1'	1.0	GEL	5/30/14	< 0.00414	< 0.00414	< 0.00414	< 0.00414		ND
	SB16-14-25-6'	6.0	GEL	7/3/14	< 0.00395	< 0.00395	< 0.00395	< 0.00395		ND

**Table B-5 (Cont'd)**  
**Soil Sampling Results from Old Town Demolition Project-Building 16/16A Area**  
**Polychlorinated Biphenyls**  
(concentrations in mg/kg)

						PCBs-8082**				
						Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1268
Screening Level*										Total PCBs
Location	Sample ID	Depth (ft)	Lab	Date						0.94
SS16-14-26	SS16-14-26-0'	0.0	CT	5/30/14	< 0.0098	< 0.0098	< 0.0098	< 0.0098	< 0.0098	ND
	SS16-14-26-1'	1.0	CT	5/30/14	< 0.0098	< 0.0098	< 0.0098	< 0.0098	< 0.0098	ND
SB16-14-27	SB16-14-27-0'	0.0	CT	5/30/14	< 0.0098	< 0.0098	< 0.0098	< 0.0098	< 0.0098	ND
	SB16-14-27-1'	1.0	CT	5/30/14	< 0.0098	< 0.0098	< 0.0098	< 0.0098	< 0.0098	ND
	SB16-14-27-6'	6.0	CT	7/3/14	< 0.067	< 0.067	< 0.067	0.17	< 0.067	0.17
SS16-14-28	SS16-14-28-0'	0.0	CT	5/30/14	< 0.0098	< 0.0098	0.22	0.14	< 0.0098	0.36
	SS16-14-28-1'	1.0	CT	5/30/14	< 0.0094	< 0.0094	< 0.0094	< 0.0094	< 0.0094	ND
SS16-14-29	SS16-14-29-0'	0.0	CT	5/30/14	< 0.0098	< 0.0098	< 0.0098	< 0.0098	< 0.0098	ND
	SS16-14-29-1'	1.0	CT	5/30/14	< 0.0094	< 0.0094	0.085	0.018	< 0.0094	0.103
SB16-14-31	SB16-14-31-0'	0.0	CT	6/3/18	< 0.0097	< 0.0097	< 0.0097	< 0.0097	< 0.0097	ND
	SB16-14-31-1'	1.0	CT	6/3/18	< 0.0097	< 0.0097	< 0.0097	< 0.0097	< 0.0097	ND
SS16-14-32	SS16-14-32-0'	0.0	CT	5/30/14	< 0.0097	< 0.0097	< 0.0097	0.022	< 0.0097	0.022
	SS16-14-32-1'	1.0	CT	5/30/14	< 0.0096	< 0.0096	< 0.0096	0.0042 <sup>J</sup>	< 0.0096	0.0042 <sup>J</sup>
SS16-14-33	SS16-14-33-0'	0.0	CT	5/30/14	< 0.0093	< 0.0093	< 0.0093	< 0.0093	< 0.0093	ND
	SS16-14-33-1'	1.0	CT	5/30/14	< 0.0099	< 0.0099	< 0.0099	0.012	< 0.0099	0.012
SS16-14-34	SS16-14-34-0'	0.0	CT	5/30/14	< 0.0099	< 0.0099	< 0.0099	< 0.0099	< 0.0099	ND
	SS16-14-34-1'	1.0	CT	5/30/14	< 0.0098	< 0.0098	0.53	0.13	< 0.0098	0.66
	SS16-14-34-2'	2.0	CT	6/11/14	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	ND
SS16-14-35	SS16-14-35-0'	0.0	CT	5/30/14	< 0.0097	< 0.0097	< 0.0097	< 0.0097	< 0.0097	ND
	SS16-14-35-1'	1.0	CT	5/30/14	< 0.069	< 0.069	4.2	0.22	< 0.069	<b>4.42</b>
	SS16-14-35-2'	2.0	CT	6/11/14	< 0.012	< 0.012	0.74	< 0.012	< 0.012	0.74
SS16-14-38	SS16-14-38-0'	0.0	GEL	7/21/14	< 0.00369	< 0.00369	0.0134	0.0128		0.0262
	SS16-14-38-1'	1.0	GEL	7/21/14	< 0.0368	< 0.0368	0.185	0.141		0.325
SB16-14-54	SB16-14-54-3"	0.0	CT	6/25/14	< 0.0098	< 0.0098	< 0.0098	0.023	< 0.0098	0.023
	SB16-14-54-1'	1.0	CT	6/25/14	< 0.033	< 0.033	2.2	0.37	< 0.033	<b>2.57</b>
	SB16-14-54-2'	2.0	CT	7/21/14	< 0.067	< 0.067	10	0.74	< 0.067	<b>10.74</b>
	SB16-14-54-3'	3.0	CT	7/21/14	< 0.0098	< 0.0098	< 0.0098	< 0.0098	< 0.0098	ND
SB16-14-56	SB16-14-56-3"	0.0	CT	6/25/14	< 0.033	< 0.033	0.59	0.2	< 0.033	0.79
	SB16-14-56-1'	1.0	CT	6/25/14	< 0.033	< 0.033	2.5	0.18	< 0.033	<b>2.68</b>
	SB16-14-56-2'	2.0	CT	7/21/14	< 0.0099	< 0.0099	0.011	< 0.0099	< 0.0099	0.011
	SB16-14-56-3'	3.0	CT	7/21/14	< 0.0096	< 0.0096	< 0.0096	< 0.0096	< 0.0096	ND
SS16-14-57	SS16-14-57-3"	0.0	CT	6/25/14	< 0.034	< 0.034	0.21	0.067	< 0.034	0.277
	SS16-14-57-1'	1.0	CT	6/25/14	< 0.033	< 0.033	0.2	0.082	< 0.033	0.282
SS16-14-63	SS16-14-63-3"	0.0	CT	7/3/14	< 0.066	< 0.066	0.73	0.35	< 0.066	<b>1.08</b>
	SS16-14-63-1'	1.0	CT	7/3/14	< 0.067	< 0.067	1.0	0.66	< 0.067	<b>1.66</b>
SS16-14-64	SS16-14-64-1'	1.0	CT	7/21/14	< 0.0093	< 0.0093	0.091	< 0.0093	< 0.0093	0.091
	SS16-14-64-2'	2.0	CT	7/21/14	< 0.34	< 0.34	6.7	< 0.34	< 0.34	<b>6.7</b>
SS16-14-65	SS16-14-65-0'	0.0	CT	7/21/14	< 0.013	< 0.013	0.8	< 0.013	< 0.013	0.8
	SS16-14-65-1'	1.0	CT	7/21/14	< 0.034	< 0.034	0.61	< 0.034	< 0.034	0.61
SS16-14-66	SS16-14-66-0'	0.0	CT	7/21/14	< 0.014	< 0.014	0.43	< 0.014	< 0.014	0.43
SS16-14-67	SS16-14-67-0'	0.0	CT	7/21/14	< 0.0099	< 0.0099	0.027	0.024	< 0.0099	0.051
	SS16-14-67-1'	1.0	CT	7/21/14	< 0.033	< 0.033	2.3	< 0.033	< 0.033	<b>2.3</b>
SS16-14-68	SS16-14-68-1'	1.0	CT	7/21/14	< 0.0097	< 0.0097	< 0.0097	< 0.0097	< 0.0097	ND
	SS16-14-68-2'	2.0	CT	7/21/14	< 0.0095	< 0.0095	< 0.0095	< 0.0095	< 0.0095	ND
SS16-14-69	SS16-14-69-0'	0.0	CT	7/25/14	< 0.0096	< 0.0096	< 0.0096	0.063	< 0.0096	0.063
	SS16-14-69-1'	1.0	CT	7/25/14	< 0.0097	< 0.0097	< 0.0097	0.086	0.038	0.124
SS16-14-70	SS16-14-70-0'	0.0	CT	7/25/14	< 0.0097	< 0.0097	0.18	0.064	< 0.0097	0.244
	SS16-14-70-1'	1.0	CT	7/25/14	< 0.0096	< 0.0096	0.39	0.18	< 0.0096	0.57

**Table B-5 (Cont'd)**  
**Soil Sampling Results from Old Town Demolition Project-Building 16/16A Area**  
**Polychlorinated Biphenyls**  
(concentrations in mg/kg)

Location	Sample ID	Depth (ft)	Lab	Date	PCBs-8082**					Total PCBs
					Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1268	
					Screening Level*					
										0.94
SS16-14-71	SS16-14-71-0'	0.0	CT	7/25/14	< 0.0096	< 0.0096	< 0.0096	< 0.0096	< 0.0096	ND
	SS16-14-71-1'	1.0	CT	7/25/14	< 0.0097	< 0.0097	0.024	0.028	< 0.0097	0.052
SS16-14-72	SS16-14-72-0'	0.0	CT	7/25/14	< 0.033	< 0.033	2.1	0.67	< 0.033	<b>2.77</b>
	SS16-14-72-1'	1.0	CT	7/25/14	< 0.0096	< 0.0096	0.046	< 0.0096	< 0.0096	0.046
SS16-14-73	SS16-14-73-0'	0.0	CT	7/25/14	< 0.0096	< 0.0096	< 0.0096	0.073	< 0.0096	0.073
	SS16-14-73-1'	1.0	CT	7/25/14	< 0.0097	< 0.0097	0.13	0.053	< 0.0097	0.183
SS16-14-74	SS16-14-74-0'	0.0	CT	7/25/14	< 0.0096	< 0.0096	0.22	0.087	< 0.0096	0.307
	SS16-14-74-1'	1.0	CT	7/25/14	< 0.034	< 0.034	< 0.034	< 0.034	< 0.034	ND
SS16-14-75	SS16-14-75-0'	0.0	CT	7/25/14	< 0.068	< 0.068	3.1	0.55	< 0.068	<b>3.65</b>
	SS16-14-75-1'	1.0	CT	7/25/14	< 0.0096	< 0.0096	0.19	0.035	< 0.0096	0.225
SS16-14-76	SS16-14-76-0'	0.0	CT	7/25/14	< 0.33	< 0.33	26	3.2	< 0.33	<b>29.2</b>
	SS16-14-76-1'	1.0	CT	7/25/14	< 0.0095	< 0.0095	0.089	0.02	< 0.0095	0.109
SS16-14-77	SS16-14-77-0'	0.0	CT	7/25/14	< 0.0098	< 0.0098	0.51	0.22	< 0.0098	0.73
	SS16-14-77-1'	1.0	CT	7/25/14	< 0.0099	< 0.0099	0.039	0.029	< 0.0099	0.068
SS16-14-78	SS16-14-78-0'	0.0	CT	7/25/14	< 0.069	< 0.069	4.4	1.3	< 0.069	<b>5.7</b>
	SS16-14-78-1'	1.0	CT	7/25/14	< 0.0098	< 0.0098	0.02	0.019	< 0.0098	0.039
SS16-14-79	SS16-14-79-0'	0.0	CT	7/25/14	< 0.0098	< 0.0098	0.42	0.15	< 0.0098	0.57
	SS16-14-79-1'	1.0	CT	7/25/14	< 0.0096	< 0.0096	0.17	0.26	< 0.0096	0.43
SS16-14-80	SS16-14-80-0'	0.0	CT	7/25/14	< 0.0097	< 0.0097	0.4	0.15	< 0.0097	0.55
	SS16-14-80-1'	1.0	CT	7/25/14	< 0.0094	< 0.0094	< 0.0094	0.029	< 0.0094	0.029
SS16-14-81	SS16-14-81-0.5'	0.5	CT	8/1/14	< 0.033	< 0.033	2	0.19	< 0.033	<b>2.19</b>
	SS16-14-81-1.5'	1.5	CT	8/1/14	< 0.13	< 0.13	3.6	0.27	< 0.13	<b>3.87</b>
SS16-14-82	SS16-14-82-0.5'	0.5	CT	8/1/14	< 0.0095	< 0.0095	0.05	< 0.0095	< 0.0095	0.05
	SS16-14-82-1.5'	1.5	CT	8/1/14	< 0.0094	< 0.0094	< 0.0094	< 0.0094	< 0.0094	ND
SS16-14-83	SS16-14-83-0.5'	0.5	CT	8/1/14	< 0.0094	< 0.0094	< 0.0094	< 0.0094	< 0.0094	ND
	SS16-14-83-1.5'	1.5	CT	8/1/14	< 0.0095	< 0.0095	< 0.0095	< 0.0095	< 0.0095	ND
SS16-14-84	SS16-14-84-0.5'	0.5	CT	8/1/14	< 0.0095	< 0.0095	< 0.0095	< 0.0095	< 0.0095	ND
	SS16-14-84-1.5'	1.5	CT	8/1/14	< 0.0096	< 0.0096	< 0.0096	< 0.0096	< 0.0096	ND
SS16-14-85	SS16-14-85-0.5'	0.5	CT	8/1/14	< 0.009	< 0.009	< 0.009	< 0.009	< 0.009	ND
	SS16-14-85-1.5'	1.5	CT	8/1/14	< 0.0098	< 0.0098	< 0.0098	< 0.0098	< 0.0098	ND
B16-SD-026	B16-SD-026-0.5	0.5	CT	12/16/15	< 0.071 <sup>b</sup>	< 0.071 <sup>b</sup>	< 0.071 <sup>b</sup>	0.16 <sup>b</sup>	< 0.071 <sup>b</sup>	0.16 <sup>b</sup>
	B16-SD-026-1.0	1.0	CT	12/16/15	< 0.088 <sup>b</sup>	< 0.088 <sup>b</sup>	< 0.088 <sup>b</sup>	< 0.088 <sup>b</sup>	< 0.088 <sup>b</sup>	ND <sup>b</sup>
B16-SD-027	B16-SD-027-0.5	0.5	CT	12/16/15	< 0.085 <sup>b</sup>	< 0.085 <sup>b</sup>	0.12 <sup>b</sup>	< 0.085 <sup>b</sup>	< 0.085 <sup>b</sup>	0.12 <sup>b</sup>
	B16-SD-027-1.0	1.0	CT	12/16/15	< 0.083 <sup>b</sup>	< 0.083 <sup>b</sup>	< 0.083 <sup>b</sup>	< 0.083 <sup>b</sup>	< 0.083 <sup>b</sup>	ND <sup>b</sup>
	(D)	1.0	CT	12/16/15	< 0.089	< 0.089	< 0.089	< 0.089	< 0.089	ND
B16-SD-028	B16-SD-028-0.5	0.5	CT	12/16/15	< 0.068	< 0.068	< 0.068	< 0.068	< 0.068	ND
	B16-SD-028-1.0	1.0	CT	12/16/15	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	ND
B16-SD-029	B16-SD-029-0.5'	0.5	CT	12/17/15	< 0.068	< 0.068	< 0.068	< 0.068	< 0.068	ND
	B16-SD-029-1.0'	1.0	CT	12/17/15	< 0.073	< 0.073	< 0.073	< 0.073	< 0.073	ND
B16-SD-030	B16-SD-030-0.5'	0.5	CT	12/17/15	< 0.069	< 0.069	< 0.069	< 0.069	< 0.069	ND
	B16-SD-030-1.0'	1.0	CT	12/17/15	< 0.068	< 0.068	< 0.068	< 0.068	< 0.068	ND
B16-SD-031	B16-SD-031-0.5'	0.5	CT	12/17/15	< 0.083	< 0.083	0.35	0.26	< 0.083	0.61
	B16-SD-031-1.0'	1.0	CT	12/17/15	< 0.075	< 0.075	< 0.075	< 0.075	< 0.075	ND
B16-SD-032	B16-SD-032-0.25'	0.25	CT	12/17/15	< 0.076	< 0.076	< 0.076	< 0.076	< 0.076	ND
	B16-SD-032-1.0'	1.0	CT	12/17/15	< 0.071	< 0.071	< 0.071	< 0.071	< 0.071	ND

**Table B-5 (Cont'd)**  
**Soil Sampling Results from Old Town Demolition Project-Building 16/16A Area**  
**Polychlorinated Biphenyls**  
(concentrations in mg/kg)

Location	Sample ID	Depth (ft)	Lab	Date	PCBs-8082**					Total PCBs
					Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1268	
					Screening Level*					
										0.94
B16-SD-033	B16-SD-033-0.25'	0.25	CT	12/17/15	< 0.084	< 0.084	2.8	0.55	< 0.084	<b>3.4</b>
	B16-SD-033-1.0'	1.0	CT	12/17/15	< 0.081	< 0.081	0.44	0.31	< 0.081	0.76
	B16-SD-033-2.0'	2.0	CT	12/17/15	< 0.088	< 0.088	< 0.088	< 0.088	< 0.088	ND
	B16-SD-033-3.0'	3.0	CT	12/17/15	< 0.012	< 0.012	0.074	0.019	< 0.012	0.092
	B16-SD-033-4.0'	4.0	CT	12/17/15	< 0.088	< 0.088	< 0.088	< 0.088	< 0.088	ND
B16-SD-034	B16-SD-034-0.25'	0.25	CT	12/17/15	< 0.08	< 0.08	1.4	0.29	< 0.08	<b>1.7</b>
	B16-SD-034-1.0'	1.0	CT	12/17/15	< 0.08	< 0.08	0.47	0.23	< 0.08	0.7
	B16-SD-034-2.0'	2.0	CT	12/17/15	< 0.084	< 0.084	0.48	0.16	< 0.084	0.64
	B16-SD-034-3.0'	3.0	CT	12/17/15	< 0.083	< 0.083	< 0.083	< 0.083	< 0.083	ND
	B16-SD-034-4.0'	4.0	CT	12/17/15	< 0.084	< 0.084	< 0.084	< 0.084	< 0.084	ND
B16-SD-035	B16-SD-035-0.25'	0.25	CT	12/17/15	< 0.085	< 0.085	1.4	0.37	< 0.085	<b>1.7</b>
	B16-SD-035-1.0'	1.0	CT	12/17/15	< 0.081	< 0.081	3.3	0.52	< 0.081	<b>3.8</b>
	B16-SD-035-2.0'	2.0	CT	12/17/15	< 0.097	< 0.097	< 0.097	< 0.097	< 0.097	ND
	B16-SD-035-3.0'	3.0	CT	12/17/15	< 0.013	< 0.013	0.029	< 0.013	< 0.013	0.029
	B16-SD-035-4.0'	4.0	CT	12/17/15	< 0.088	< 0.088	< 0.088	< 0.088	< 0.088	ND
B16-SD-036	B16-SD-036-0.25'	0.25	CT	12/17/15	< 0.084	< 0.084	0.32	< 0.084	< 0.084	0.32
	B16-SD-036-1.0'	1.0	CT	12/17/15	< 0.084	< 0.084	< 0.084	< 0.084	< 0.084	ND
B16-SD-037	B16-SD-037-0.25'	0.25	CT	12/17/15	< 0.084	< 0.084	0.47	0.16	< 0.084	0.63
	B16-SD-037-1.0'	1.0	CT	12/17/15	< 0.078	< 0.078	< 0.078	< 0.078	< 0.078	ND
	B16-SD-037-2.0'	2.0	CT	12/17/15	< 0.081	< 0.081	< 0.081	< 0.081	< 0.081	ND
	B16-SD-037-3.0'	3.0	CT	12/17/15	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	ND
B16-SD-038	B16-SD-038-0.25'	0.25	CT	12/17/15	< 0.09	< 0.09	0.4	0.22	< 0.09	0.62
	B16-SD-038-1.0'	1.0	CT	12/17/15	< 0.078	< 0.078	0.38	0.099	< 0.078	0.48
B16-SD-039	B16-SD-039-0.25'	0.3	CT	12/17/15	< 0.85	< 0.85	13	2.3	< 0.85	<b>16</b>
	B16-SD-039-1.0'	1.0	CT	12/17/15	< 0.084	< 0.084	0.69	0.2	< 0.084	0.89
	B16-SD-039-2.0'	2.0	CT	12/17/15	< 0.087	< 0.087	< 0.087	< 0.087	< 0.087	ND
	B16-SD-039-3.0'	3.0	CT	12/17/15	< 0.087	< 0.087	< 0.087	< 0.087	< 0.087	ND
	B16-SD-039-4.0'	4.0	CT	12/17/15	< 0.084	< 0.084	< 0.084	< 0.084	< 0.084	ND
B16-SD-040	B16-SD-040-0.25'	0.25	CT	12/17/15	< 0.088	< 0.088	3.5	0.65	< 0.088	<b>4.1</b>
	B16-SD-040-1.0'	1.0	CT	12/17/15	< 0.086	< 0.086	1.7	0.43	< 0.086	<b>2.2</b>
	B16-SD-040-2.0'	2.0	CT	12/17/15	< 0.086	< 0.086	< 0.086	< 0.086	< 0.086	ND
	B16-SD-040-3.0'	3.0	CT	12/17/15	< 0.083	< 0.083	< 0.083	< 0.083	< 0.083	ND
	B16-SD-040-4.0'	4.0	CT	12/17/15	< 0.082	< 0.082	< 0.082	< 0.082	< 0.082	ND
	(D)	4.0	CT	12/17/15	< 0.084	< 0.084	< 0.084	< 0.084	< 0.084	ND
B16-SD-041	B16-SD-041-0.25'	0.25	CT	12/17/15	< 0.088	< 0.088	0.4	0.12	< 0.088	0.52
	B16-SD-041-1.0'	1.0	CT	12/17/15	< 0.093	< 0.093	< 0.093	< 0.093	< 0.093	ND
B16-SD-042	B16-SD-042-0.25'	0.25	CT	12/17/15	< 0.075	< 0.075	0.15	< 0.075	< 0.075	0.15
	(D)	0.3	CT	12/17/15	< 0.073	< 0.073	0.19	< 0.073	< 0.073	0.19
	B16-SD-042-1.0'	1.0	CT	12/18/15	< 0.01	< 0.01	0.16	0.035	< 0.01	0.195
B16-SD-043	B16-SD-043-2.0'	2.0	CT	12/18/15	< 0.088	< 0.088	< 0.088	< 0.088	< 0.088	ND
B16-SD-062	B16-SD-062-0.5	0.5	CT	1/12/16	< 0.089	< 0.089	< 0.089	< 0.089	< 0.089	ND
	B16-SD-062-1.0	1.0	CT	1/12/16	< 0.089	< 0.089	< 0.089	< 0.089	< 0.089	ND
B16-SD-063	B16-SD-063-0.5	0.5	CT	1/12/16	< 0.089	< 0.089	< 0.089	< 0.089	< 0.089	ND
	B16-SD-063-1.0	1.0	CT	1/12/16	< 0.081	< 0.081	< 0.081	< 0.081	< 0.081	ND
B16-SD-064	B16-SD-064-0.5	0.5	CT	1/12/16	< 0.074	< 0.074	< 0.074	< 0.074	< 0.074	ND
	B16-SD-064-1.0	1.0	CT	1/12/16	< 0.072	< 0.072	< 0.072	< 0.072	< 0.072	ND

**Table B-5 (Cont'd)**  
**Soil Sampling Results from Old Town Demolition Project-Building 16/16A Area**  
**Polychlorinated Biphenyls**  
(concentrations in mg/kg)

Location	Sample ID	Depth (ft)	Lab	Date	PCBs-8082**					
					Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1268	Total PCBs
					Screening Level*					0.94
B16-SD-065	B16-SD-065-0.5 (D)	0.5	CT	1/12/16	<0.012	<0.012	<0.012	0.015	<0.012	0.015
		0.5	CT	1/12/16	< 0.083	< 0.083	< 0.083	< 0.083	< 0.083	ND
	B16-SD-065-1.0	1.0	CT	1/12/16	< 0.084	< 0.084	< 0.084	< 0.084	< 0.084	ND
B16-SD-066	B16-SD-066-0.5 (D)	0.5	CT	1/13/16	< 0.085	< 0.085	< 0.085	< 0.085	< 0.085	ND
		0.5	CT	1/13/16	< 0.086	< 0.086	< 0.086	< 0.086	< 0.086	ND
	B16-SD-066-1.0	1.0	CT	1/13/16	< 0.084	< 0.084	< 0.084	< 0.084	< 0.084	ND
B16-SD-067	B16-SD-067-0.5	0.5	CT	1/13/16	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	ND
	B16-SD-067-1.0	1.0	CT	1/13/16	< 0.089	< 0.089	< 0.089	< 0.089	< 0.089	ND
B16-SD-068	B16-SD-068-0.5	0.5	CT	1/13/16	< 0.086	< 0.086	< 0.086	< 0.086	< 0.086	ND
	B16-SD-068-1.0	1.0	CT	1/13/16	< 0.082	< 0.082	< 0.082	< 0.082	< 0.082	ND
B16-SD-069	B16-SD-069-0.5	0.5	CT	1/13/16	0.14	< 0.087	1.5	0.42	< 0.087	<b>2.0</b>
	B16-SD-069-1.0	1.0	CT	1/13/16	< 0.086	< 0.086	1.1	0.24	< 0.086	<b>1.4</b>
	B16-SD-069-2.0	2.0	CT	1/13/16	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	ND
	B16-SD-069-3.0	3.0	CT	1/13/16	< 0.088	< 0.088	< 0.088	< 0.088	< 0.088	ND
	B16-SD-069-4.0	4.0	CT	1/13/16	< 0.085	< 0.085	0.12	< 0.085	< 0.085	0.12
B16-SD-070	B16-SD-070-0.75	0.75	CT	1/14/16	< 0.082	< 0.082	< 0.082	< 0.082	< 0.082	ND
B16-SD-072	B16-SD-072-0.5 (D)	0.5	CT	1/14/16	< 0.079	< 0.079	< 0.079	< 0.079	< 0.079	ND
		0.5	CT	1/14/16	< 0.082	< 0.082	< 0.082	< 0.082	< 0.082	ND
	B16-SD-072-1.0	1.0	CT	1/14/16	< 0.084	< 0.084	< 0.084	< 0.084	< 0.084	ND
B16-SD-073	B16-SD-073-0.5	0.5	CT	1/15/16	< 0.081	< 0.081	< 0.081	< 0.081	< 0.081	ND
	B16-SD-073-1.0	1.0	CT	1/15/16	< 0.077	< 0.077	< 0.077	< 0.077	< 0.077	ND
B16-SD-074	B16-SD-074-0.5 (D)	0.5	CT	1/15/16	< 0.084	< 0.084	< 0.084	< 0.084	< 0.084	ND
		0.5	CT	1/15/16	< 0.087	< 0.087	< 0.087	< 0.087	< 0.087	ND
	B16-SD-074-1.0	1.0	CT	1/15/16	< 0.081	< 0.081	< 0.081	< 0.081	< 0.081	ND
B16-SD-075	B16-SD-075-0.5	0.5	CT	1/15/16	< 0.097	< 0.097	< 0.097	< 0.097	< 0.097	ND
	B16-SD-075-1.0	1.0	CT	1/15/16	< 0.013	< 0.013	< 0.013	< 0.013	< 0.013	ND
B16-SD-076	B16-SD-076-0.5	0.5	CT	1/15/16	< 0.077	< 0.077	< 0.077	< 0.077	< 0.077	ND
	B16-SD-076-1.0	1.0	CT	1/15/16	< 0.087	< 0.087	2.0	0.5	< 0.087	<b>2.5</b>
	B16-SD-076-2.0	2.0	CT	1/15/16	< 0.17	< 0.17	1.9	< 0.17	< 0.17	<b>1.9</b>
B16-SD-077	B16-SD-077-0.5	0.5	CT	1/15/16	< 0.075	< 0.075	0.16	< 0.075	< 0.075	0.16
	B16-SD-077-1.0	1.0	CT	1/15/16	< 0.071	< 0.071	< 0.071	0.25	0.22	0.47
B16-SD-078	B16-SD-078-0.5	0.5	CT	1/18/16	< 0.084	< 0.084	0.18	0.16	< 0.084	0.34
	B16-SD-078-1.0	1.0	CT	1/18/16	< 0.087	< 0.087	< 0.087	< 0.087	< 0.087	ND
B16-SD-079	B16-SD-079-0.5	0.5	CT	1/18/16	< 0.071	< 0.071	< 0.071	< 0.071	< 0.071	ND
	B16-SD-079-1.0	1.0	CT	1/18/16	< 0.011	< 0.011	< 0.011	0.19	< 0.011	0.19
B16-SD-080	B16-SD-080-0.5	0.5	CT	1/18/16	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	ND
	B16-SD-080-1.0 (D)	1.0	CT	1/18/16	< 0.079	< 0.079	0.11	0.36	< 0.079	0.47
		1.0	CT	1/18/16	< 0.074	< 0.074	0.11	0.26	< 0.074	0.37
B16-SD-081	B16-SD-081-0.5	0.5	CT	1/18/16	< 0.067	< 0.067	< 0.067	< 0.067	< 0.067	ND
	B16-SD-081-1.0	1.0	CT	1/18/16	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	ND
B16-SD-082	B16-SD-082-0.5	0.5	CT	1/18/16	< 0.07	< 0.07	< 0.07	< 0.07	< 0.07	ND
	B16-SD-082-1.0	1.0	CT	1/18/16	< 0.072	< 0.072	< 0.072	< 0.072	< 0.072	ND
B16-SD-083	B16-SD-083-0.5	0.5	CT	1/18/16	< 0.069	< 0.069	< 0.069	< 0.069	< 0.069	ND
	B16-SD-083-1.0	1.0	CT	1/18/16	< 0.074	< 0.074	< 0.074	< 0.074	< 0.074	ND
B16-SD-085	B16-SD-085-0.5	0.5	CT	1/18/16	< 0.069	< 0.069	< 0.069	< 0.069	< 0.069	ND
	B16-SD-085-1.0	1.0	CT	1/18/16	< 0.074	< 0.074	< 0.074	< 0.074	< 0.074	ND
B16-SD-093	B16-SD-093-0.5	0.5	CT	1/20/16	< 0.094	< 0.094	< 0.094	< 0.094	< 0.094	ND
	B16-SD-093-1.0	1.0	CT	1/20/16	< 0.094	< 0.094	< 0.094	< 0.094	< 0.094	ND

**Table B-5 (Cont'd)**  
**Soil Sampling Results from Old Town Demolition Project-Building 16/16A Area**  
**Polychlorinated Biphenyls**  
(concentrations in mg/kg)

Location	Sample ID	Depth (ft)	Lab	Date	PCBs-8082**					Total PCBs
					Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Aroclor-1268	
					Screening Level*					
										0.94
B16-SD-094	B16-SD-094-0.5	0.5	CT	1/20/16	< 0.094	< 0.094	< 0.094	< 0.094	< 0.094	ND
	B16-SD-094-1.0	1.0	CT	1/20/16	< 0.095	< 0.095	< 0.095	< 0.095	< 0.095	ND
B16-SD-095	B16-SD-095-0.75	0.75	CT	1/21/16	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08	ND
	B16-SD-095-1.0	1.0	CT	1/21/16	< 0.089	< 0.089	< 0.089	< 0.089	< 0.089	ND
B16-SD-107	B16-SD-107-2.0	2.0	CT	1/20/16	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	ND
	B16-SD-107-3.0	3.0	CT	1/20/16	< 0.088	< 0.088	< 0.088	< 0.088	< 0.088	ND
	B16-SD-107-4.0	4.0	CT	1/20/16	< 0.089	< 0.089	< 0.089	< 0.089	< 0.089	ND
B16-SD-108	B16-SD-108-0.5	0.5	CT	1/20/16	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	ND
	B16-SD-108-1.0	1.0	CT	1/20/16	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	ND
B16-SD-109	B16-SD-109-0.5	0.5	CT	1/20/16	< 0.079	< 0.079	< 0.079	< 0.079	< 0.079	ND
	B16-SD-109-1.0	1.0	CT	1/20/16	< 0.082	< 0.082	< 0.082	< 0.082	< 0.082	ND
B16-SD-110	B16-SD-110-0.5	0.5	CT	1/20/16	< 0.075	< 0.075	< 0.075	< 0.075	< 0.075	ND
	B16-SD-110-1.0	1.0	CT	1/20/16	< 0.083	< 0.083	< 0.083	< 0.083	< 0.083	ND
B16-SD-111	B16-SD-111-0.5	0.5	CT	1/20/16	< 0.087	< 0.087	0.11	0.12	0.094	0.33
	B16-SD-111-1.0	1.0	CT	1/20/16	< 0.081	< 0.081	< 0.081	< 0.081	< 0.081	ND
B16-SD-112	B16-SD-112-0.5	0.5	CT	1/20/16	< 0.077	< 0.077	< 0.077	< 0.077	< 0.077	ND
	B16-SD-112-1.0	1.0	CT	1/20/16	< 0.089	< 0.089	< 0.089	< 0.089	< 0.089	ND
B16-SD-113	B16-SD-113-0.5	0.5	CT	1/26/16	< 0.087	< 0.087	< 0.087	< 0.087	< 0.087	ND
	B16-SD-113-1.0	1.0	CT	1/26/16	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	ND
B16-SD-114	B16-SD-114-0.75	0.75	CT	1/26/16	< 0.077	< 0.077	< 0.077	< 0.077	< 0.077	ND
	(D)	0.75	CT	1/26/16	< 0.076	< 0.076	< 0.076	< 0.076	< 0.076	ND
	B16-SD-114-1.1	1.0	CT	1/26/16	< 0.076	< 0.076	< 0.076	< 0.076	< 0.076	ND
B16-SD-121	B16-SD-121-0.5	0.5	CT	2/16/16	< 0.085	< 0.085	< 0.085	< 0.085	< 0.085	ND
	B16-SD-121-1.0	1.0	CT	2/16/16	< 0.082	< 0.082	< 0.082	< 0.082	< 0.082	ND
B14-SD-044	B14-SD-044-0.5'	0.5	CT	12/18/15	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09	ND
	B14-SD-044-1.0'	1.0	CT	12/18/15	< 0.013	< 0.013	< 0.013	< 0.013	< 0.013	ND
	(D)	1.0	CT	12/18/15	< 0.013	< 0.013	< 0.013	< 0.013	< 0.013	ND
B14-SD-115	B14-SD-115-0.5'	0.5	CT	1/27/16	< 0.073	< 0.073	< 0.073	< 0.073	< 0.073	ND
	B14-SD-115-1.0'	1.0	CT	1/27/16	< 0.073	< 0.073	< 0.073	< 0.073	< 0.073	ND
B14-SD-116	B14-SD-116-0.5'	0.5	CT	1/27/16	< 0.073	< 0.073	< 0.073	< 0.073	< 0.073	ND
	B14-SD-116-1.0'	1.0	CT	1/27/16	< 0.074	< 0.074	< 0.074	< 0.074	< 0.074	ND
	(D)	1.0	CT	1/27/16	< 0.073	< 0.073	< 0.073	< 0.073	< 0.073	ND
B14-SD-117	B14-SD-117-0.5'	0.5	CT	1/27/16	< 0.075	< 0.075	< 0.075	< 0.075	< 0.075	ND
	B14-SD-117-1.0'	1.0	CT	1/27/16	< 0.037	< 0.037	< 0.037	< 0.037	< 0.037	ND

\* The screening level is the composite worker (industrial) regional screening level of 0.94 mg/kg for high risk Aroclors published by the EPA Region 9 in the "Regional Screening Levels for Chemical Contaminants at Superfund Sites," <http://www.epa.gov/region9/superfund/prg/>, accessed on February 12, 2016.

\*\* Analytes included Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, and 1268 unless otherwise noted as "not analyzed".

Boldface type indicates concentration above screening level

BC: Analysis by BC Laboratories

CT: Analysis by Curtis & Tompkins Ltd

GEL: Analysis by General Engineering Laboratories LLC

< concentration less than limit of quantitation (LOQ)

not analyzed

ND: No PCB Aroclors detected

(D): Duplicate sample

<sup>b</sup> sample was extracted outside of hold time

<sup>j</sup> indicates an estimated value reported by the analytical laboratory. Data qualifiers assigned during independent data validation are not included in this summary, but are provided in the data validation report in Appendix C.

## **Appendix C. Analytical Laboratory Reports and Data Validation Reports for 2015 Sampling at Buildings 52, 52A, and the Electrical Pad and Buildings 16 and 16A**

Provided on electronic media, as follows:

1. Reports for Buildings 52, 52A, and the Electrical Pad provided on USB drive with original application submitted on February 22, 2016;
2. Reports for Buildings 16 and 16A provided on USB drive submitted with revision 1 of the application on March 25, 2016



## **Appendix F. Verification Sampling Grid Calculations and Determination**



### **Verification Sampling Grid Calculations and Determination**

The verification sampling grid spacing was calculated with Visual Sample Plan (VSP) (VSP Development Team, 2016). Using VSP's function to compare a mean or median to a fixed threshold, a minimum number of samples required to meet the assigned decision parameters of the PCB cleanup (see Section 6.1) was calculated. VSP was then used to calculate grid spacing that would produce this number of samples.

The parameters necessary for calculating the number of samples by VSP are:

1. Frequency distribution (to determine statistical calculation method)
2. Estimation of the standard deviation
3. Alpha level (Type I error rate)
4. Beta level (Type II error rate)
5. Width of gray region
6. Threshold level

Separate grids were developed for each of the following areas, as described below:

1. Buildings 52 and 52A and the electrical pad; and
2. Buildings 16 and 16A.

#### **Buildings 52 and 52A, and the Electrical Pad**

For Buildings 52 and 52A and the electrical pad, the first two parameters used to calculate the number of samples required for verification of cleanup completion (frequency distribution and estimate of the standard deviation) were determined by statistically analyzing the total PCB concentrations in previous samples. The complete data set of samples that had been collected in the vicinity of the planned excavations (Appendix A, Figure A-4) is provided in Table B-1 and shown in Figure A-1 in Appendix A.

A subset was selected from this data set to conservatively represent the relevant statistical qualities (*e.g.*, standard deviation) of the PCB concentrations that would remain in soil after cleanup. This subset is comprised of results from samples collected deeper than one foot below the ground surface. Because the planned excavations will be at least one-foot deep, sample results collected at one foot and shallower are not representative of soil that will remain after cleanup. The subset also excludes results from soil samples collected in areas contaminated by discharges that could have migrated via vertical conduits, such as sumps. These data are excluded to better represent contamination resulting from downward vertical migration of PCBs from the ground surface. Specifically, the excluded results are from soil contaminated by releases at the sump on the west side of Building 52 (boring locations SB52-14-20 and SB52-14-29) and soil with PCBs detected beneath clean soil (samples SB52-14-22-8'-12' and SB52-14-28-9', with total PCB concentrations of 0.032 and 0.45 mg/kg, respectively). The subset used for the development of the grid comprises 120 samples. PCBs were detected in 22 of these 120 samples (Table F-1).

The sum of the detected Aroclors and the highest of the laboratory reporting limits for individual Aroclors (for Aroclors reported as not detected) were used in the VSP and ProUCL calculations (see discussion below). These values are identified in Table F-1 as "Total PCB Concentration."

**Table F-1. Data Set of 120 Samples to Calculate Statistical Parameters for ProUCL And VSP Calculations  
– Buildings 52 And 52A, and the Electrical Pad**

Sample ID	Depth (ft. bgs)	Sample Date	Total PCB Concentration (mg/kg)	Detection Flag
B16-SD-057-2.0	2	1/8/16	0.09	ND
B16-SD-057-3.0	3	1/8/16	0.09	ND
B16-SD-057-4.0	4	1/8/16	0.088	ND
B52-SD-003-2.0'	2	12/8/15	0.088	ND
B52-SD-003-3.0'	3	12/8/15	0.013	ND
B52-SD-003-4.0'	4	12/8/15	0.09	ND
B52-SD-008-2.0	2	12/9/15	3.3	detect
B52-SD-020-2.0	2	12/16/15	0.091	ND
B52-SD-020-3.0	3	12/16/15	0.087	ND
B52-SD-020-4.0	4	12/16/15	0.088	ND
BS-SB52A-00-16-2	2	3/17/00	0.01	ND
BS-SB-95-1-3	3	6/27/95	0.01	ND
BS-SB-95-1-6	6	6/27/95	0.01	ND
BS-SB-95-2-3	3	6/27/95	0.16	detect
BS-SB-95-2-6	6	6/27/95	0.01	ND
BS-SB-96-10-5	5	8/26/96	0.01	ND
BS-SB-96-1-5	5	7/22/96	0.01	ND
BS-SB-96-2-5	5	7/22/96	0.01	ND
BS-SB-96-3-5	5	7/22/96	0.01	ND
BS-SB-96-4-5	5	7/22/96	0.14	detect
BS-SB-96-5-1.5	1.5	7/22/96	0.02	detect
BS-SB-96-6-5	5	8/26/96	0.01	ND
BS-SB-96-8-5	5	8/26/96	0.01	ND
BS-SB-96-9-5	5	8/26/96	0.01	ND
BS-SB-97-1-1.5	1.5	3/21/97	0.31	detect
BS-SB-97-1-4.8	4.8	3/21/97	0.01	ND
BS-SB-97-2-1.5	1.5	3/21/97	0.023	detect
BS-SB-97-2-5	5	3/21/97	0.22	detect
SB52-14-20-12.5'	12.5	5/20/14	0.0098	ND
SB52-14-20-15'	15	5/20/14	0.0097	ND
SB52-14-20-20'	20	5/20/14	0.0098	ND
SB52-14-20-24'	24	5/20/14	0.0095	ND
SB52-14-22-1.5'	1.5	5/21/14	0.012	ND
SB52-14-22-4'-8'	4	5/21/14	0.012	ND
SB52-14-24-10'	10	5/21/14	0.012	ND
SB52-14-24-16'	16	5/21/14	0.012	ND
SB52-14-24-2'	2	5/21/14	0.19	detect
SB52-14-24-5'	5	5/21/14	0.012	ND

**Table F-1. Data Set of 120 Samples to Calculate Statistical Parameters for ProUCL And VSP Calculations  
– Buildings 52 And 52A, and the Electrical Pad**

Sample ID	Depth (ft. bgs)	Sample Date	Total PCB Concentration (mg/kg)	Detection Flag
SB52-14-25-10'	10	5/20/14	0.012	ND
SB52-14-25-13'	13	5/20/14	0.012	ND
SB52-14-25-15.5'	15.5	5/20/14	0.012	ND
SB52-14-25-5'	5	5/20/14	0.012	ND
SB52-14-26-3'	3	5/9/14	0.012	ND
SB52-14-26-6'	6	5/9/14	0.012	ND
SB52-14-27-10'	10	5/21/14	0.012	ND
SB52-14-27-15'	15	5/21/14	0.012	ND
SB52-14-27-2'	2	5/21/14	0.037	detect
SB52-14-27-20'	20	5/21/14	0.012	ND
SB52-14-27-24'	24	5/21/14	0.012	ND
SB52-14-27-5'	5	5/21/14	0.012	ND
SB52-14-28-3'	4	5/9/14	0.012	ND
SB52-14-28-6'	6	5/9/14	0.012	ND
SB52-14-30-1.5'	1.5	5/14/14	1.1	detect
SB52-14-30-4.5'	4.5	5/14/14	0.82	detect
SB52-14-31-2'	2	5/14/14	2.2	detect
SB52-14-31-3'	3	6/13/14	0.36	detect
SB52-14-34-2'	2	7/21/14	0.24	detect
SB52-14-35-10'	10	5/21/14	0.0099	ND
SB52-14-35-15'	15	5/21/14	0.0099	ND
SB52-14-35-2'	2	5/21/14	0.0091	J
SB52-14-35-5'	5	5/21/14	0.0098	ND
SB52-14-36-2'	2	6/13/14	0.0095	ND
SB52-14-37-2'	2	6/16/14	0.0096	ND
SB52-14-38-2'	2	6/16/14	0.074	detect
SB52-14-43-3'	3	7/7/14	4.44	detect
SB52-14-43-6'	6	7/7/14	0.062	detect
SB52-14-45-2'	2	7/21/14	0.62	detect
SB52-14-46-2.5'	2.5	7/21/14	0.07	detect
SB52-14-49-1.5'	1.5	7/30/14	0.0096	ND
SB52-14-50-1.4'	1.4	7/30/14	0.0095	ND
SB52-14-53-1.5'	1.5	7/30/14	0.0095	ND
SB52-14-55-1.4'	1.4	7/30/14	0.0094	ND
SB52-14-56-1.9'	1.9	7/30/14	0.035	detect
SB52-14-56-3.9'	3.9	7/30/14	0.0099	ND
SB52-14-57-3'	3	7/21/14	0.0098	ND
SB52-14-60-3'	3	7/21/14	0.0098	ND

**Table F-1. Data Set of 120 Samples to Calculate Statistical Parameters for ProUCL And VSP Calculations  
– Buildings 52 And 52A, and the Electrical Pad**

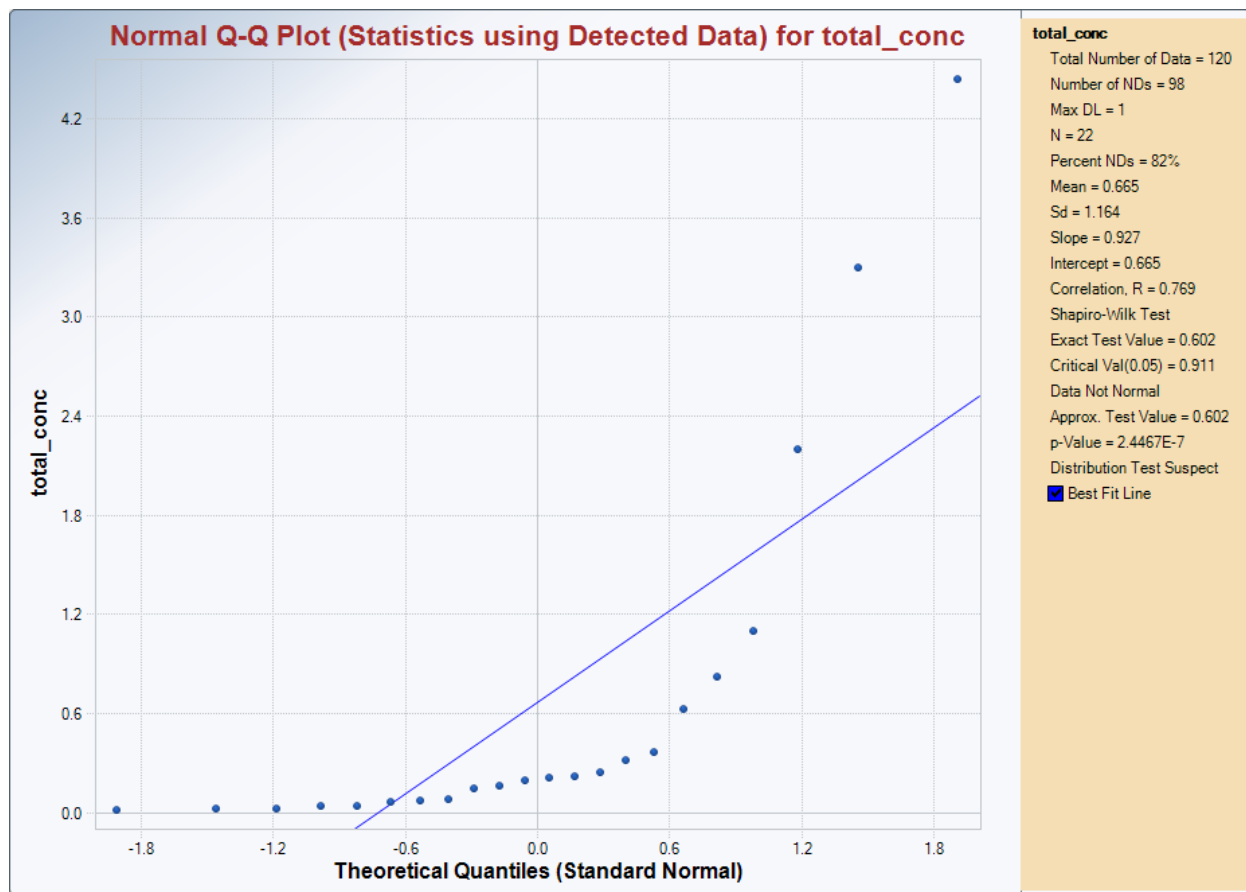
Sample ID	Depth (ft. bgs)	Sample Date	Total PCB Concentration (mg/kg)	Detection Flag
SB52-14-61-3'	3	7/21/14	0.0093	ND
SB52-14-62-1.4'	1.4	7/30/14	0.0095	ND
SB52-14-8-10'	10	5/21/14	0.0097	ND
SB52-14-8-15'	15	5/21/14	0.0097	ND
SB52-14-8-5'	5	5/21/14	0.0093	ND
SB52-14-8-6'	6	5/21/14	0.0098	ND
SB52-14-9A-10'	10	5/7/14	0.012	ND
SB52-14-9A-8'	8	5/7/14	0.012	ND
SB52-14-9B-10'	10	5/7/14	0.012	ND
SB52-14-9B-12'	12	5/21/14	0.0098	ND
SB52-14-9B-3'	3	5/21/14	0.0095	ND
SB52-14-9B-6'	6	5/21/14	0.0098	ND
SB52-14-9B-8'	8	5/7/14	0.012	ND
SB52-14-9B-9'	9	5/21/14	0.0097	ND
SB52A-14-1C-3'	3	7/18/14	0.207	detect
SB52A-14-1H-3'	3	7/18/14	0.0094	ND
SS52-10-1-3	3	6/11/10	0.2	ND
SS52-10-1-4	4	6/11/10	0.2	ND
SS52-10-3-3	3	6/11/10	0.2	ND
SS52-10-3-5	5	6/11/10	0.2	ND
SS52-10-4-3	3	6/11/10	0.2	ND
SS52-10-4-5	5	6/11/10	0.2	ND
SS52-10-5-3	3	6/14/10	0.2	ND
SS52-10-5-5	5	6/14/10	0.2	ND
SS52-10-6-3	3	6/11/10	0.2	ND
SS52-10-6-5	5	6/11/10	0.2	ND
SS52-10-7-3	3	6/14/10	0.2	ND
SS52-10-7-5	5	6/14/10	0.2	ND
SS52-10-8-3	3	6/14/10	0.2	ND
SS52-10-8-5	5	6/14/10	0.2	ND
SS52-10-9-3	3	6/14/10	0.2	ND
SS52-10-9-5	5	6/14/10	0.2	ND
SS52-11-1-3	3	9/16/11	1	ND
SS52-11-2-3	3	9/15/11	1	ND
SS52-11-3-3	3	9/15/11	1	ND
SS52-11-4-3	3	9/16/11	1	ND
SS52-11-5-3	3	9/15/11	1	ND
SS52-11-7-3	3	9/15/11	1	ND

**Table F-1. Data Set of 120 Samples to Calculate Statistical Parameters for ProUCL And VSP Calculations  
– Buildings 52 And 52A, and the Electrical Pad**

Sample ID	Depth (ft. bgs)	Sample Date	Total PCB Concentration (mg/kg)	Detection Flag
SS52-11-8-3	3	9/15/11	1	ND
SS52-14-11-1.5	1.5	3/3/14	0.012	ND
SS52A-14-1-1.5	1.5	7/18/14	0.0095	ND
SS52A-14-1B-3'	3	7/18/14	0.0096	ND
SS52A-14-8-1.5	1.5	2/24/14	0.2	ND
SS52A-14-9-1.5	1.5	2/24/14	0.2	ND
<b>Notes:</b> Sample IDs are the same as those in Table B-1. For those samples that did not have Sample IDs in Table B-1, the IDs given here follow the convention of appending the depth to the Location ID.  <b>Abbreviations:</b> ft. bgs = feet below ground surface mg/kg = milligrams per kilogram ND = no PCBs detected in the sample J = PCBs were detected, but below the reporting limit				

An assumed frequency distribution (input parameter 1, above) is the basis for selecting the calculation method. The data set selected (Table F-1) has a frequency distribution that is not normal or symmetrical, as illustrated by the graph and associated calculation from ProUCL in Figure F-1 (ProUCL v. 5.0.00). This graph shows a normal Q-Q plot of the 22 detected PCB concentrations that does not follow the expected straight line of a normal distribution. The conclusion of the associated Shapiro-Wilk Test is in agreement. The appropriate method in VSP to calculate the minimum number of samples from populations that are not normally distributed or symmetrical is the MARSSIM Sign Test (MARSSIM, 2000, Section 5.5.2.3). Because the data are not normally distributed, the MARSSIM Sign Test was selected because it is a non-parametric test; the other tests available in VSP for calculating the expected minimum number of samples to compare a mean to a fixed threshold are not non-parametric. The MARSSIM Sign Test is based on comparing the median value – as an estimate of the mean – to the action level.

Figure F-1. Normal Q-Q plot for checking the normality of the total PCB concentrations in the data subset from the Building 52 and 52A area.



The estimated standard deviation (input parameter 2, above) was calculated also with ProUCL, using the Kaplan-Meier method for censored data sets (US EPA, 2013, Section 4.4). The Kaplan-Meier method is a non-parametric statistical method for estimating an empirical cumulative distribution function for a censored data set. Parameters such as the standard deviation can then be derived from this function. Using the Kaplan-Meier method, the standard deviation of the data is estimated to be 0.55 mg/kg. Table F-2 shows the output from ProUCL, highlighting the estimated standard deviation using the Kaplan-Meier (KM SD) method including the non-detects.

**Table F-2. Output from ProUCL Showing General Statistics of the PCB Data Set for Buildings 52 and 52A, and the Electrical Pad.**

General Statistics on Uncensored Data											
Date/Time of Computation			2/11/2016 8:07:58 PM								
User Selected Options											
From File			WorkSheet.xls								
Full Precision			OFF								
From File: WorkSheet.xls											
General Statistics for Censored Datasets (with NDs) using Kaplan Meier Method											
Variable	NumObs	# Missing	Num Ds	NumNDs	% NDs	Min ND	Max ND	KM Mean	KM Var	KM SD	KM CV
total_conc	120	0	22	98	81.67%	0.0093	1	0.133	0.302	0.549	4.132
General Statistics for Raw Dataset using Detected Data Only											
Variable	NumObs	# Missing	Minimum	Maximum	Mean	Median	Var	SD	MAD/0.675	Skewness	CV
total_conc	22	0	0.0091	4.44	0.665	0.199	1.355	1.164	0.239	2.429	1.749
Percentiles using all Detects (Ds) and Non-Detects (NDs)											
Variable	NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
total_conc	120	0	0.00959	0.0098	0.00998	0.012	0.2	0.2	0.64	1	3.091

Input parameters 3 through 5 are discussed in Section 6.1 of this Work Plan. The threshold level (input parameter 6) is the 0.94 mg/kg cleanup level.

Input parameters used in VSP are summarized in Table F-3. The following screenshot (Figure F-2) illustrates the inputs entered into VSP and the result of the calculation.

**Table F-3. VSP Input Parameters for Calculating Minimum Required Number of Samples – Buildings 52 and 52A, and the Electrical Pad**

Input Parameter	Value
Frequency distribution	Not normal and not symmetric
Standard-deviation estimation	0.55 mg/kg
Alpha level (Type I error rate)	10%
Beta level (Type II error rate)	20%
Width of gray region	0.2 mg/kg
Threshold level	0.94 mg/kg

**Figure F-2. Screenshot from VSP Showing the Input Parameters and Resulting Calculation of the Minimum Number of Samples Required to Verify Cleanup Completion at Building 52 and 52A, and the Electrical Pad**

The screenshot shows the 'True Average vs. Fixed Threshold' window of the VSP software. The 'Average vs. Fixed Threshold' tab is selected. The interface includes several input fields and dropdown menus for specifying data distribution, assessment goals, and design parameters. The calculated 'Minimum Number of Samples for PCBs, total' is 56, and the 'Actual samples placed on the map' is 57.

**True Average vs. Fixed Threshold**

Average vs. Fixed Threshold | Sample Placement | Costs | Data Analysis | Analytes

I  assume the data will be normally distributed. For Help, highlight an item and press F1

I assume that my data are

I want to assess for  I want to calculate the number of samples using

These design parameters apply to

**Specify Null Hypothesis:**  
I want to assume the site is  until proven otherwise.  
(Assume the true median  $\geq$  action level.)

**Specify False Rejection Rate (alpha) and Action Level:**  
I want at least  % confidence that I will conclude the site is unacceptable (dirty) if the true median is at or above the action level of  units.

**Specify Width of Gray Region (delta) and False Acceptance Rate (beta):**  
If the true median is  units below the action level (that is, 0.74 units) then I want no more than a  % chance of incorrectly accepting the null hypothesis that the site is unacceptable (true median  $\geq$  action level).

The estimated standard deviation due to sampling and analytical variability is   units.

I expect the mean to be

Minimum Number of Samples for PCBs, total: 56 EMC Calculations

Minimum Number of Samples in Survey Unit: 56 +  % = 56

Actual samples placed on the map (required for chosen systematic pattern): 57

Close Cancel Apply Help

The number of samples calculated using VSP to meet the sampling goals (i.e., Type I and II decision error probabilities, and width of the gray region per Section 6.1 of this work plan) is 56. Output from VSP is included in the Table F-4, below, and the following graphical representation (Figure F-3) shows the probability of making a correct decision as a function of the true mean.

**Table F-4. Output from VSP Summarizing the Sampling Design for Buildings 52 and 52A, and the Electrical Pad**

<b>SUMMARY OF SAMPLING DESIGN</b>	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	56
Number of samples on map <sup>a</sup>	57
Number of selected sample areas <sup>b</sup>	3
Specified sampling area <sup>c</sup>	3521.38 ft <sup>2</sup>
Size of grid / Area of grid cell <sup>d</sup>	7.9298 feet / 62.8818 ft <sup>2</sup>
Grid pattern	Square

<sup>a</sup> This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.

<sup>b</sup> The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.

<sup>c</sup> The sampling area is the total surface area of the selected colored sample areas on the map of the site.

<sup>d</sup> Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.

<sup>e</sup> Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.

**Figure F-3. Graph Showing the Probability of Making a Correct Decision Given the Decision Parameters for the Cleanup and Characteristics of the Assumed Frequency Distribution of PCBs at Buildings 52 and 52A, and the Electrical Pad**

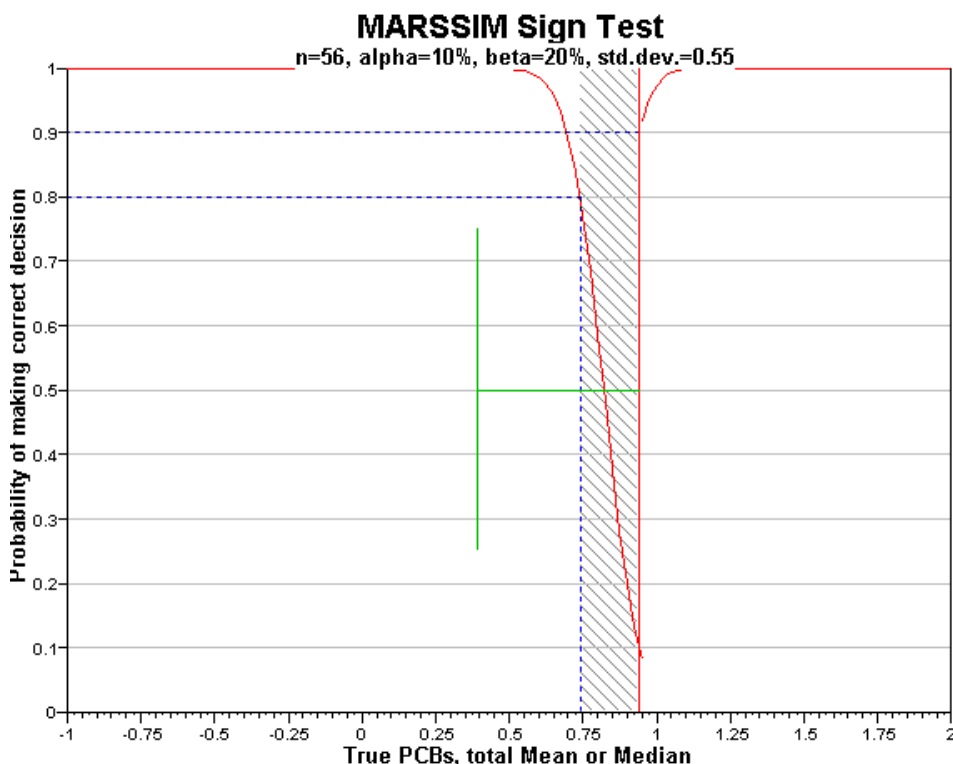
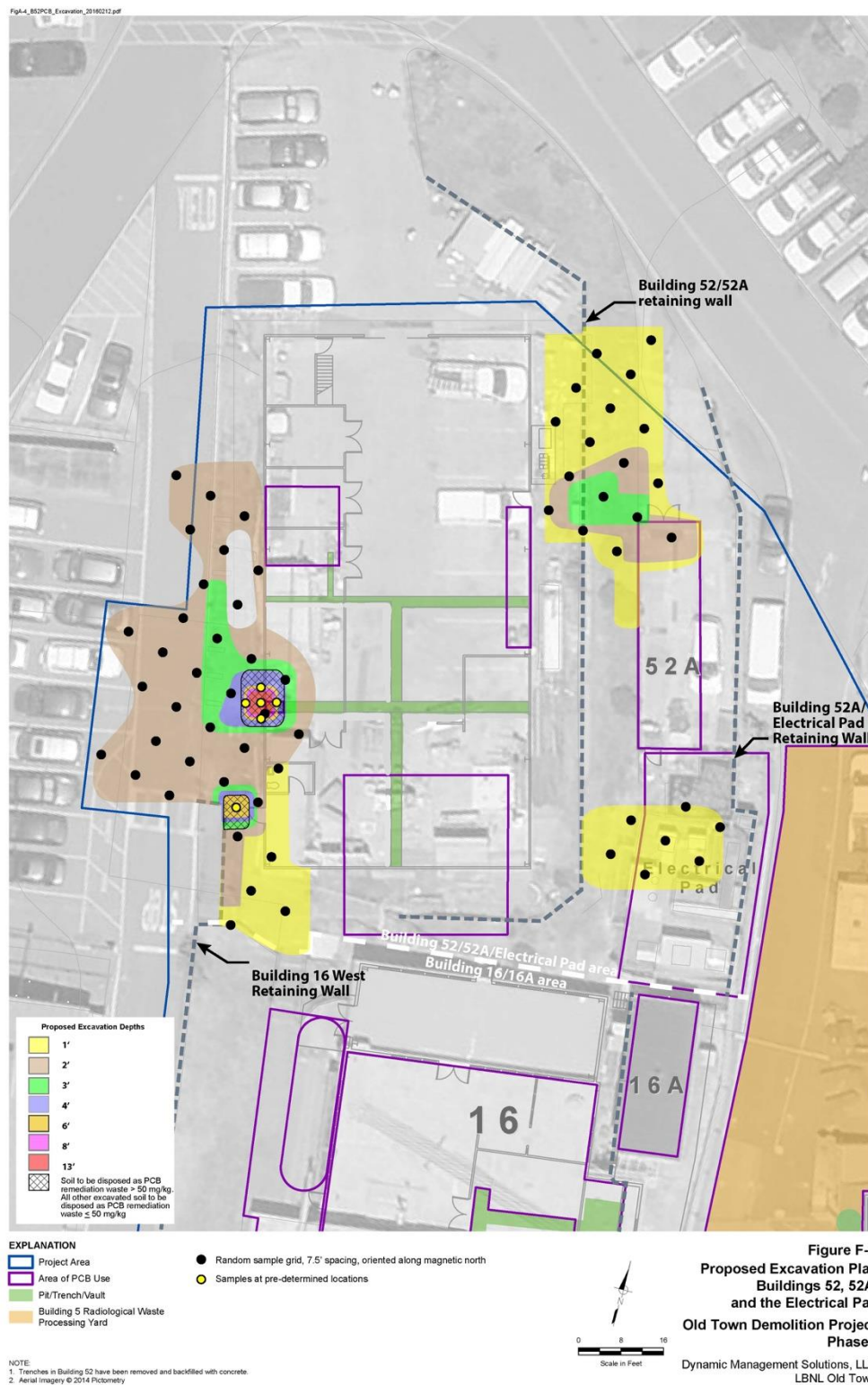


Figure F-4 is a map showing the footprint of excavations at Buildings 52 and 52A, and the electrical pad with a probable grid layout oriented with magnetic north and at a sample spacing of 7.5 feet. In this example, this sample spacing resulted in 59 samples. This map is provided for illustrative purposes only; the actual grid layout will differ based on random starting points for the grid determined in the field. Also, because of edge effects caused by the geometries of the excavation footprints, the sample spacing might result in a different total number of samples from different starting points. A sample spacing of 7.5 feet is expected to produce at least 56 samples based on the excavation area shown in Figure A-4. If the excavation is expanded, the sample spacing will remain fixed and additional samples will be required. If the excavation area is divided into multiple decision units to allow incremental backfilling, the sample spacing will remain fixed at 7.5 feet, such that the total number of samples required for the entire excavation area (the aggregate area of decision units) will be at least 56 samples.

In addition to the randomly located samples on the regular grid, Figure F-4 shows 6 additional samples to be collected at pre-determined locations at the zones of deeper excavation where the concentrations of total PCBs exceed 50 mg/kg. These predetermined locations are described in Section 6.2.

Figure F-4. Example Sampling Grid and Predetermined Sample Locations Buildings 52 and 52A, and the Electrical Pad



### **Buildings 16 and 16A**

For Buildings 16 and 16A, the first two parameters used to calculate the number of samples required for verification of cleanup completion (frequency distribution and estimate of the standard deviation) were determined by statistically analyzing the total PCB concentrations in previous samples. The complete data set of samples that had been collected in the vicinity of the planned excavations (Figure A-8) is provided in Table B-5 and shown in Figure A-6 in Appendix A.

A subset was selected from this data set to conservatively represent the relevant statistical qualities (*e.g.*, standard deviation) of the PCB concentrations that would remain in soil after cleanup. This subset is comprised of results from samples collected deeper than one foot below the ground surface. Because the planned excavations will be at least one foot deep, sample results collected at one foot and shallower are not representative of soil that will remain after cleanup. The subset also excludes results from soil samples collected in the southern end of Building 16, because the depth profiles of PCB concentrations in these samples are unlike the depth profiles in other samples. Whereas the total PCB concentrations in most other samples are highest at the surface and attenuate rapidly with depth, at the southern end of Building 16 the concentrations are highest between 1 and 2 feet below the surface, possibly due to surface contamination covered by new soil placed there during the addition of Room 101 to Building 16 in the 1970s (Appendix A, Figure A-6). The subset used for the development of the grid comprises 61 samples. PCBs were detected in 17 of the 61 samples (Table F-1).

The sum of the Aroclors detected and the highest of the laboratory reporting limits for individual Aroclors (for Aroclors not detected) were used in the VSP and ProUCL calculations (see discussion below). These values are identified in Table F-5 as “Total PCB Concentration.”

**Table F-5. Data Set of 61 Samples from the Building 16 and 16A Area Used to Calculate Statistical Parameters for ProUCL and VSP Calculations**

<b>Sample ID</b>	<b>Depth (ft. bgs)</b>	<b>Sample Date</b>	<b>Total PCB Concentration (mg/kg)</b>	<b>Detection Flag</b>
BS-SB16-97-10-2.4	2.4	3/20/97	0.013	<b>detect</b>
BS-SB16-97-10-5	5.0	3/21/97	0.01	<b>ND</b>
BS-SB16-97-11-10.8	10.8	11/10/97	0.01	<b>ND</b>
BS-SB16-97-11-3.5	3.5	11/10/97	0.01	<b>ND</b>
BS-SB16-97-1-2	2.0	3/20/97	0.01	<b>ND</b>
BS-SB16-97-1-5	5.0	3/21/97	0.01	<b>ND</b>
BS-SB16-97-2-2.3	2.3	3/20/97	0.01	<b>ND</b>
BS-SB16-97-2-5.2	5.2	3/21/97	0.01	<b>ND</b>
BS-SB16-97-3-2	2.0	3/20/97	0.16	<b>detect</b>
BS-SB16-97-3A-5	5.0	3/27/97	0.01	<b>ND</b>
BS-SB16-97-4-2	2.0	3/20/97	0.16	<b>detect</b>
BS-SB16-97-4-4.9	4.9	3/27/97	0.14	<b>detect</b>
BS-SB16-97-5A-4.9	4.9	3/27/97	0.01	<b>ND</b>
BS-SB16-97-6A-5	5.0	3/27/97	0.01	<b>ND</b>
BS-SB16-97-7-2	2.0	3/20/97	0.025	<b>detect</b>
BS-SB16-97-7-5.3	5.3	3/21/97	0.01	<b>ND</b>
BS-SB16-97-8-1.8	1.8	3/20/97	0.01	<b>ND</b>
BS-SB16-97-8-5	5.0	3/21/97	0.01	<b>ND</b>

**Table F-5. Data Set of 61 Samples from the Building 16 and 16A Area Used to Calculate Statistical Parameters for ProUCL and VSP Calculations**

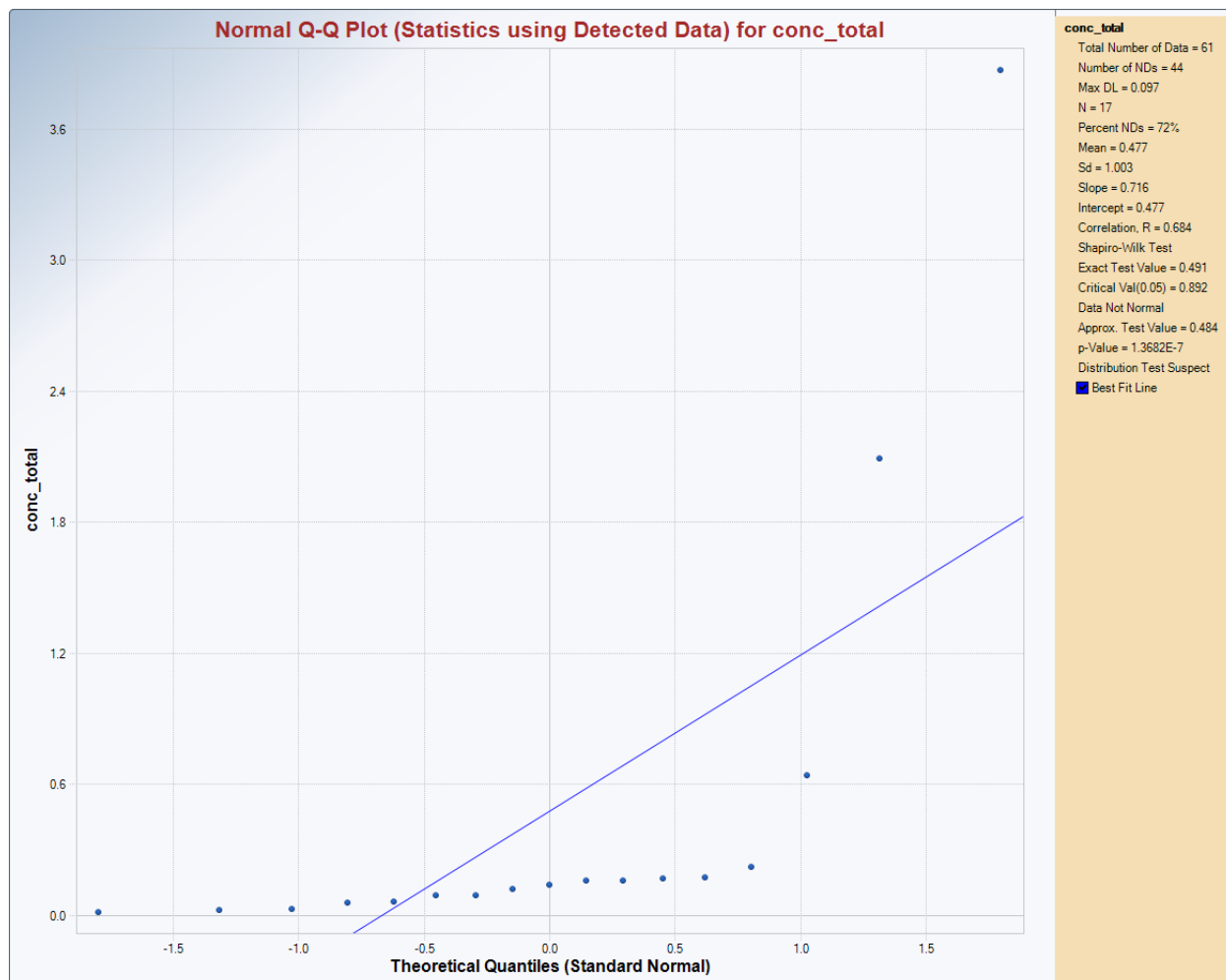
Sample ID	Depth (ft. bgs)	Sample Date	Total PCB Concentration (mg/kg)	Detection Flag
BS-SB16-97-9-2	2.0	3/20/97	0.01	ND
BS-SB16-97-9-5	3.0	3/21/97	0.01	ND
BS-SB16N-96-1-6.5	6.5	8/27/96	0.01	ND
BS-SB16N-96-1-9	9.0	8/27/96	0.088	detect
B16-SD-033-2.0'	2.0	12/17/15	0.088	ND
B16-SD-033-3.0'	3.0	12/17/15	0.092	detect
B16-SD-033-4.0'	4.0	12/17/15	0.088	ND
B16-SD-034-2.0'	2.0	12/17/15	0.64	detect
B16-SD-034-3.0'	3.0	12/17/15	0.083	ND
B16-SD-034-4.0'	4.0	12/17/15	0.084	ND
B16-SD-035-2.0'	2.0	12/17/15	0.097	ND
B16-SD-035-3.0'	3.0	12/17/15	0.029	detect
B16-SD-035-4.0'	4.0	12/17/15	0.088	ND
B16-SD-037-2.0'	2.0	12/17/15	0.081	ND
B16-SD-037-3.0'	3.0	12/17/15	0.08	ND
B16-SD-039-2.0'	2.0	12/17/15	0.087	ND
B16-SD-039-3.0'	3.0	12/17/15	0.087	ND
B16-SD-039-4.0'	4.0	12/17/15	0.084	ND
B16-SD-040-2.0'	2.0	12/17/15	0.086	ND
B16-SD-040-3.0'	3.0	12/17/15	0.083	ND
B16-SD-040-4.0'	4.0	12/17/15	0.082	ND
B16-SD-040-4.0'	4.0	12/17/15	0.084	ND
B16-SD-043-2.0'	2.0	12/18/15	0.088	ND
B16-SD-069-2.0	2.0	1/13/16	0.09	ND
B16-SD-069-3.0	3.0	1/13/16	0.088	ND
B16-SD-069-4.0	4.0	1/13/16	0.12	detect
SB16-14-20-5'	5.0	5/30/14	0.0043	ND
SB16-14-25-6'	6.0	7/3/14	0.00395	ND
SB16-14-27-6'	6.0	7/3/14	0.17	detect
SS16-14-10-1.5'	1.5	6/2/14	0.0095	ND
SS16-14-10A-2'	2.0	7/21/14	2.09	detect
SS16-14-1-1.5'	1.5	5/30/14	0.22	detect
SS16-14-11-1.5'	1.5	6/2/14	0.169	detect
SS16-14-23-1.5'	1.5	6/2/14	0.0098	ND
SS16-14-24-1.5'	1.5	6/2/14	0.0098	ND
SS16-14-3-1.5'	1.5	5/30/14	0.055	detect
SS16-14-4-1.5'	1.5	5/30/14	0.061	detect
SS16-14-68-2'	2.0	7/21/14	0.0095	ND

**Table F-5. Data Set of 61 Samples from the Building 16 and 16A Area Used to Calculate Statistical Parameters for ProUCL and VSP Calculations**

Sample ID	Depth (ft. bgs)	Sample Date	Total PCB Concentration (mg/kg)	Detection Flag
SS16-14-81-1.5'	1.5	8/1/14	3.87	detect
SS16-14-82-1.5'	1.5	8/1/14	0.0094	ND
SS16-14-83-1.5'	1.5	8/1/14	0.0095	ND
SS16-14-84-1.5'	1.5	8/1/14	0.0096	ND
SS16-14-85-1.5'	1.5	8/1/14	0.0098	ND
<b>Notes:</b> Sample IDs are the same as those in Table B-5.  <b>Abbreviations:</b> ft. bgs = feet below ground surface mg/kg = milligrams per kilogram ND = no PCBs detected in the sample				

An assumed frequency distribution (input parameter 1, above) is the basis for selecting the calculation method. The data set selected (Table F-5) has a frequency distribution that is not normal or symmetrical, as illustrated by the graph and associated calculation from ProUCL in Figure F-5 (ProUCL v. 5.0.00). This graph shows a normal Q-Q plot of the 17 detected PCB concentrations that does not follow the expected straight line of a normal distribution. The conclusion of the associated Shapiro-Wilk Test is in agreement. The appropriate method in VSP to calculate the minimum number of samples from populations that are not normally distributed or symmetrical is the MARSSIM Sign Test (MARSSIM, 2000, Section 5.5.2.3). Because the data are not normally distributed, the MARSSIM Sign Test was selected because it is a non-parametric test; the other tests available in VSP for calculating the expected minimum number of samples to compare a mean to a fixed threshold are not non-parametric. The MARSSIM Sign Test is based on comparing the median value – as an estimate of the mean – to the action level.

**Figure F-5. Normal Q-Q Plot for Checking the Normality of the Total PCB Concentrations in the Data Subset for Buildings 16 and 16A**



The estimated standard deviation (input parameter 2, above) was calculated also with ProUCL, using the Kaplan-Meier method for censored data sets (US EPA, 2013, Section 4.4). The Kaplan-Meier method is a non-parametric statistical method for estimating an empirical cumulative distribution function for a censored data set. Parameters such as the standard deviation can then be derived from this function. Using the Kaplan-Meier method, the standard deviation of the data is estimated to be 0.56 mg/kg. Table F-6 shows the output from ProUCL, highlighting the estimated standard deviation using the Kaplan-Meier (KM SD) method including the non-detects.

**Table F-6. Output from ProUCL Showing General Statistics of the PCB Data Set from Buildings 16 and 16A**

General Statistics on Uncensored Data											
Date/Time of Computation			3/14/2016 4:27:52 PM								
User Selected Options											
From File			WorkSheet.xls								
Full Precision			OFF								
From File: WorkSheet.xls											
General Statistics for Censored Datasets (with NDs) using Kaplan Meier Method											
Variable	NumObs	# Missing	Num Ds	NumNDs	% NDs	Min ND	Max ND	KM Mean	KM Var	KM SD	KM CV
conc_total	61	0	17	44	72.13%	0.00395	0.097	0.137	0.309	0.556	4.046
General Statistics for Raw Dataset using Detected Data Only											
Variable	NumObs	# Missing	Minimum	Maximum	Mean	Median	Var	SD	MAD/0.675	Skewness	CV
conc_total	17	0	0.013	3.87	0.477	0.14	1.007	1.003	0.117	2.981	2.105
Percentiles using all Detects (Ds) and Non-Detects (NDs)											
Variable	NumObs	# Missing	10%ile	20%ile	25%ile(Q1)	50%ile(Q2)	75%ile(Q3)	80%ile	90%ile	95%ile	99%ile
conc_total	61	0	0.0096	0.01	0.01	0.061	0.088	0.09	0.16	0.22	2.802

Input parameters 3 through 5 are discussed in Section 6.1 of this cleanup plan. The threshold level (input parameter 6) is the 0.94 mg/kg cleanup level.

Input parameters used in VSP are summarized in Table F-7. The following screenshot (Figure F-6) illustrates the inputs entered into VSP and the result of the calculation.

**Table F-7. VSP Input Parameters for Calculating Minimum Number of Samples Required for Verification of Cleanup Completion at the Buildings 16 and 16A**

Input Parameter	Value
Frequency distribution	Not normal and not symmetric
Standard-deviation estimation	0.56 mg/kg
Alpha level (Type I error rate)	10%
Beta level (Type II error rate)	20%
Width of gray region	0.2 mg/kg
Threshold level	0.94 mg/kg

**Figure F-2. Screenshot from VSP Showing the Input Parameters and Resulting Calculation of the Minimum Number of Samples Required for Verification of Cleanup Completion at Buildings 16 and 16A**

The screenshot shows the 'True Average vs. Fixed Threshold' window in the VSP software. The window has a title bar with a green icon and standard window controls. Below the title bar is a tabbed interface with tabs for 'Average vs. Fixed Threshold', 'Sample Placement', 'Costs', 'Data Analysis', and 'Analytes'. The 'Average vs. Fixed Threshold' tab is active.

Inside the tab, there are several input fields and labels:

- 'I  assume the data will be normally distributed.' with a red note: 'For Help, highlight an item and press F1'.
- 'I assume that my data are .
- 'I want to assess for .
- 'I want to calculate the number of samples using .
- 'Static' section: 'These design parameters apply to .
- 'Specify Null Hypothesis:': 'I want to assume the site is  until proven otherwise. (Assume the true median  $\geq$  action level.)
- 'Specify False Rejection Rate (alpha) and Action Level:': 'I want at least  % confidence that I will conclude the site is unacceptable (dirty) if the true median is at or above the action level of  units.
- 'Specify Width of Gray Region (delta) and False Acceptance Rate (beta):': 'If the true median is  units below the action level (that is, 0.74 units) then I want no more than a  % chance of incorrectly accepting the null hypothesis that the site is unacceptable (true median  $\geq$  action level).
- 'The estimated standard deviation due to sampling and analytical variability is  units.
- 'I expect the mean to be
- 'Minimum Number of Samples for PCBs, total: 58' with an 'EMC Calculations' button.
- 'Minimum Number of Samples in Survey Unit: 58 +  % = 58'
- 'Actual samples placed on the map (required for chosen systematic pattern): 60'

At the bottom of the window are four buttons: 'Close', 'Cancel', 'Apply', and 'Help'.

The number of samples calculated by VSP to meet the sampling goals (i.e., Type I and II decision error probabilities, and width of the gray region per Section 6.1 of this work plan) is 58. Output from VSP is included in the Table F-8, below, and the following graphical representation (Figure F-7) shows the probability of making a correct decision as a function of the true mean.

**Table F-8. Output from VSP Summarizing the Sampling Design for Buildings 16 and 16A**

<b>SUMMARY OF SAMPLING DESIGN</b>	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	58
Number of samples on map <sup>a</sup>	60
Number of selected sample areas <sup>b</sup>	3
Specified sampling area <sup>c</sup>	3151.03ft <sup>2</sup>
Size of grid / Area of grid cell <sup>d</sup>	7.37076feet / 54.3281 ft <sup>2</sup>
Grid pattern	Square

<sup>a</sup> This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.

<sup>b</sup> The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.

<sup>c</sup> The sampling area is the total surface area of the selected colored sample areas on the map of the site.

<sup>d</sup> Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.

<sup>e</sup> Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.

Figure F-7. Graph Showing the Probability of Making a Correct Decision Given the Decision Parameters for the Cleanup and Characteristics of the Assumed Frequency Distribution of PCBs at Buildings 16 And 16A

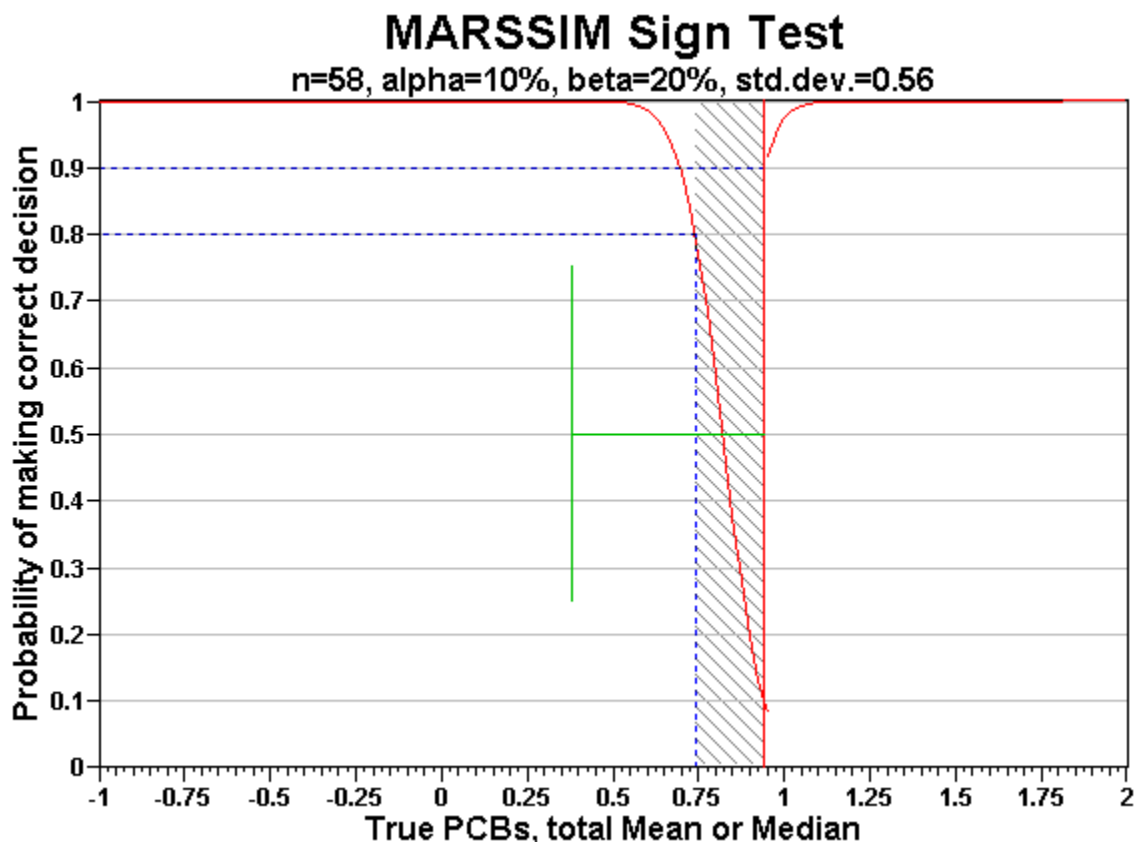
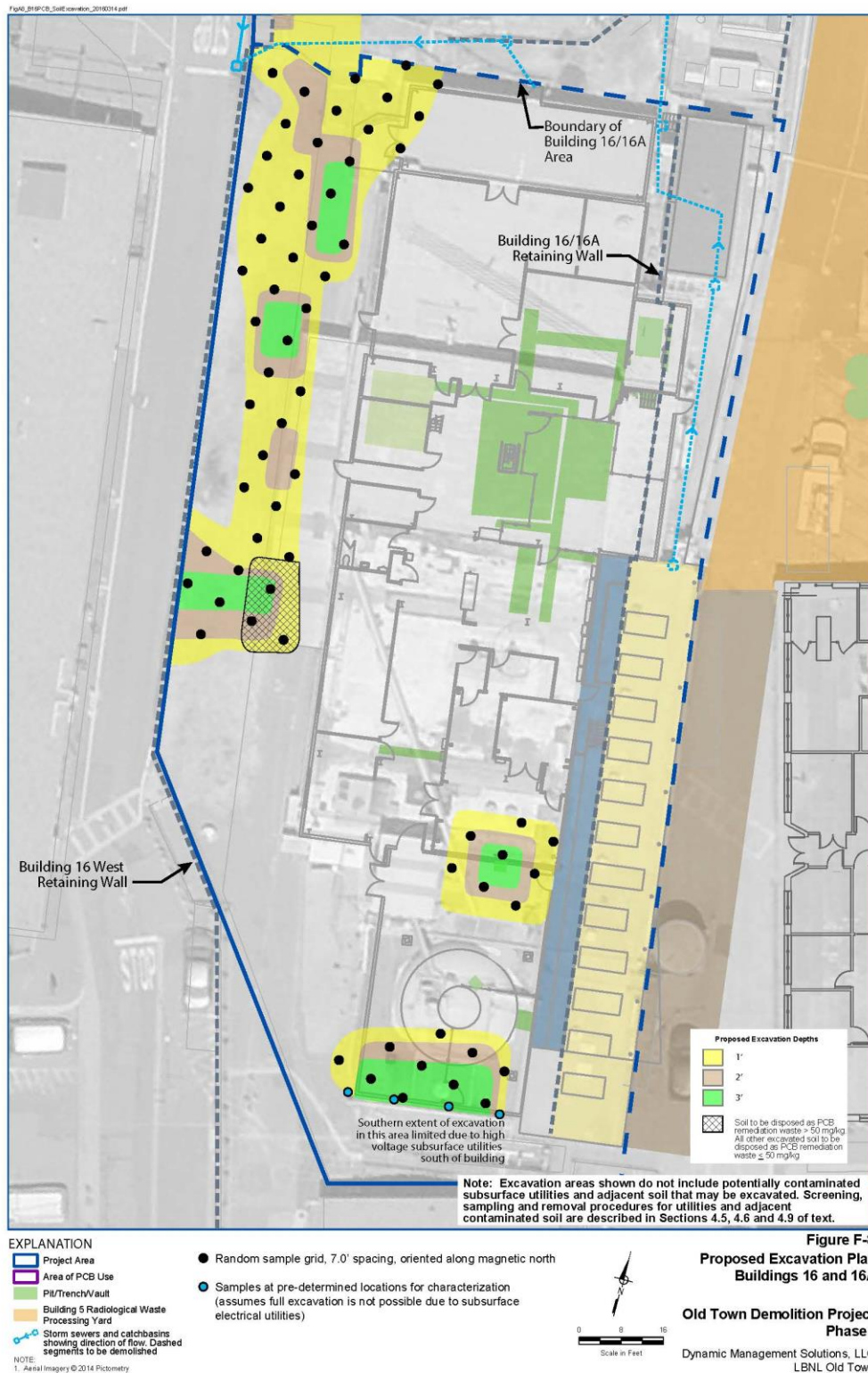


Figure F-4 is a map showing the footprints of the excavations with a probable grid layout oriented with magnetic north and at a sample spacing of 7.0 feet. In this example, this sample spacing resulted in 64 samples. This map is provided for illustrative purposes only; the actual grid layout will differ based on random starting points for the grid determined in the field. Also, because of edge effects caused by the geometries of the excavation footprints, the sample spacing might result in a different total number of samples from different starting points. A sample spacing of 7.0 feet is expected to produce at least 58 samples based on the excavation area shown in Figure A-8. If the excavation is expanded, the sample spacing will remain fixed and additional samples will be required. If the excavation area is divided into multiple decision units to allow incremental backfilling, the sample spacing will remain fixed at 7.0 feet, such that the total number of samples required for the entire excavation area (the aggregate area of decision units) will be at least 58 samples.

In addition to the randomly located samples on the regular grid, Figure F-8 shows 4 additional samples to be collected at predetermined locations at the southern sidewall of the excavation at the south of Building 16. The results of these samples will not be used to verify cleanup completion. The purpose of these samples is described in Section 6.2.

Figure F-8. Example Sampling Grid and Predetermined Sample Locations in the Buildings 16 and 16A



**REFERENCES:**

Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Revision 1, 2000.

Statistical Software ProUCL 5.0.00 for Environmental Applications for Data Sets with and without Nondetect Observations (ProUCL v.5.0.00), 2013. Updated September 19.

U.S. Environmental Protection Agency (US EPA), 2013, ProUCL Version 5.0.00 Technical Guide: Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. September.

VSP Development Team (2016). Visual Sample Plan: A Tool for Design and Analysis of Environmental Sampling. Version 7.5. Pacific Northwest National Laboratory. Richland, WA. <http://vsp.pnnl.gov>.

